IMPROVING SCHOOLS BY STANDARDIZED TESTS

BY

stevens
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UNDER THE EDITORSHIP OF

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EDITOR'S INTRODUCTION

THIS book divides itself naturally into two parts. The first part has to do with the situation in which Superintendent Brooks found himself, with his successful campaign in educating his teachers to use standardized tests, with the results which he obtained, with the way he used these results to grade his pupils, to rate his teachers, and to evaluate methods of teaching, and finally with the use he made of intelligence tests. This is the first time, so far as I know, that a practical school man has, after planning carefully and executing to the last essential detail a large testing program, set down for the guidance of other practical school men just what he did.

We have waited a long time for this. The test-makers and technical research workers have been heard from extensively; and some of them have written for the benefit of teachers and supervising officials. Here, however, is one of their number who found unfavorable conditions in the district to which he had been assigned. He secured the support of his teachers in making a survey of these conditions by means of standardized tests. He gave the tests three times and made certain important uses of the results. Teachers, pupils, and parents were in favor of the tests as he used them. Moreover, he tells us just how he did these things; and he tells the story so clearly and so vividly that any one who reads his account will feel that he can do likewise.

The second part of the book has to do with the changes

in methods of teaching which were brought about because of the knowledge gained from the tests. This is the best — is it not the only? — account of a testing program which has been carried through to its logical conclusion. It is the best answer I know to the question so often raised, "What shall we do with the results of tests?" Nor is the answer conceived narrowly. It is not concerned with mere devices. It has a philosophy, and it is broad and fundamental. Definite methods are shown and shown in detail, but they are based on sound general principles. For example, he justifies his startling doctrine that the first reading instruction should be in silent reading by the principles of association. Again, he introduces a plan of teaching children how to study because the tests measure the results of study and because if one wishes to improve the results of teaching as measured by tests, one must first improve methods of study.

Even with reference to particular subjects the measures he has adopted and described are something more than expedients. Even here they are broadly conceived. In reading, for example, he recognizes a general principle applicable to all subjects. The general principle is that in order to improve instruction in terms of test results, one must develop in the pupils the abilities which the tests measure — not other abilities, not even similar abilities, but the precise abilities which the tests measure as nearly as these can be ascertained.

I am aware that there will be a few transcendentalists among research workers who at this point will cry out that neither Superintendent Brooks nor I know what the tests measure. These are the men whose daily occupation is

straining at gnats and swallowing camels. It is well enough for them to do this among themselves, but some of them would hold up all progress while they split hairs over the setting up of a theoretically perfect "criterion" and the devising of a test of highest possible correlation with it. This is good work, and I do not deprecate it. But the work of the schools must be done. Instruments of measurement must be used even if they are lacking somewhat in validity.

At any rate, a practical man who thinks about silent reading readily concludes that *rate* and *comprehension* are the two items which ought to be measured and which the tests do apparently measure. He infers, therefore, that a method of teaching reading which is to develop the abilities measured by the tests must aim at these two objectives — rate and comprehension. This at least is Superintendent Brooks's line of thought, and he pursues it with vigor and success.

From the point of view of the expert in tests the author undoubtedly displays an uncritical acceptance of them. Fine statistical points are ignored; practice effects are forgotten; validity is assumed; and reliability is all but unquestioned. In short, the test-maker is accepted as having done his work. Some of us are sure that he is not entitled to this degree of confidence; nor — to be entirely fair — does he think so himself. For the most part he is an experimentalist, trying one device after another, calling this a reading test and that an arithmetic test, without agreeing with his fellow test-makers as to what ability in either of these subjects may be. There is in this book an impressible object lesson for the test expert. From it he may

see clearly how vital it is that he analyze the objectives in teaching and that he make his tests true measures of the extent to which the objectives are realized. It is clear that if school people are going to adopt the tests in the spirit displayed by Superintendent Brooks's teachers in chapter x, a burden of responsibility is laid upon the test-maker which he cannot evade.

Again, there will be many practical teachers, principals, and supervising officials who will feel that there are many products of teaching which the tests fail to measure. These school men and women will point out that the abilities which are here exalted are of the more formal type. Yet it is entirely possible that the abilities which the tests directly measure are representatives of the higher abilities which the tests do not directly measure and which it is undoubtedly the business of the school to inculcate. For example, rate and comprehension of reading, which the tests purport to measure directly, may fairly be said to condition the acquiring of more complex qualities having to do with taste, attitude, and appreciation — qualities which manifest themselves to an increasing degree as rate and comprehension of reading are developed. It may very well be that the better our pupils can read, add, and spell, or answer questions in language, geography, and history, the better they will manifest the qualities which are valuable in a social organism. Indeed, it can hardly be otherwise. These subjects are in the course of study by common consent; nor are the efforts of the curriculum makers, even of the most advanced type, directed toward their entire withdrawal. They are in the course of study because they are believed to serve the higher purposes of education. If

this is true, there is a case to be made out for teaching these subjects well, and for the belief that, within reasonable limits, the better they are taught, the more surely the broader purposes of education will be served. It will be time for the experts in high places and the conservatives in all places to criticize the author when they have accomplished as much without tests as he has with them.

To my mind chapters x to xv — constituting what I have called the second part of the book — are unique. Professor Cubberley has pointed out that because of the measurement movement, the whole subject of Educational Administration, in a decade or two, may need to be reorganized and books on the subject rewritten in terms of this new scientific development. The same statement may be made as to the subject of Methods of Teaching and as to books on that subject. Those methods will gain favor which produce measurable results. A method will not be taken for granted because some one high in authority favors it. In fact in these days no one high in authority will promulgate a method merely as his *ipse dixit*. Superintendent Brooks has much to offer in these last chapters about method — methods of teaching reading in both primary and upper grades, methods of handling the content subjects and of teaching children to study. But these methods are the immediate outgrowth of his testing program, and they are designed to improve the conditions which his testing program disclosed. They are methods which he has tried and the effects of which he gives us. They are therefore convincing.

B. R. Buckingham

PREFACE

This book is written for superintendents, teachers, and all other persons interested in the use of educational tests and measurements as a means of improving the work of the schools. It tells how standardized tests and scales were used periodically for two years throughout an entire supervisory district, and how the results of the tests were put to practical use in classifying pupils into grades, for measuring the progress of pupils in their studies as a partial basis for promotion of pupils, for measuring the efficiency of teachers, for measuring the relative efficiency of special methods, and for motivating the work of both teachers and pupils. It also tells of remedial measures, in the way of modification of subject-matter and teaching methods, taken to improve unsatisfactory conditions revealed by the use of the tests.

In its field, the book is unique in at least two respects: (1) it is a narration of actual experience rather than an exposition of theory, and (2) it describes in detail how a comprehensive, periodical testing program was planned and carried out, how the interested coöperation of the teachers was secured, and how the results of the tests were used to improve the schools. One whole chapter is devoted to what the teachers and pupils had to say, at the end of two years' use of the tests, as to how the tests were of help to them in their work.

So far as the author is aware, all the books previously

published on the subject of standardized tests and measurements deal almost entirely with the tests themselves; the need for them, descriptions and reproductions of them, and data concerning their derivation and standardization. Very little is said as to how the tests can be put to practical use in the schoolroom, and that little is usually expressed in very general terms. No book heretofore published describes in detail the putting of standardized tests to practical use in a concrete situation and periodically over a period of years.

The above-mentioned books have proved very valuable in making the educational public acquainted with standardized tests and their possibilities. But is it not time that we had something definite in book form as to how the tests are proving of value, or otherwise, in the hands of teachers and administrators? It was with the idea of starting something in this line that the author has set down in this book his own experiences with standardized tests as an aid in school supervision. The book does not claim to settle any of the great problems of modern education. It merely tells how standardized tests were used in an attempt to solve some of the more pressing of these problems as they appeared. In it we tell what we did, why and how we did it, and the results obtained. We have tried to tell it in such a way that any one who so desires may easily follow the general plan with modifications, if necessary, to fit his own particular field of endeavor. It is hoped that the book may prove both interesting and helpful to our fellow workers, and that it may give at least a little added momentum to the great movement toward objective measurement of "classroom products." If it ac-

complishes these objects, even in a small measure, the author will feel amply repaid for the time and labor involved in presenting his experiences for publication.

It is with pleasure and gratitude that the author here acknowledges his indebtedness to Dr. B. R. Buckingham for kindly advice and encouragement during the preparation of the work, for many helpful suggestions, for his sympathetic editing of the manuscript, and finally, for the Editor's Introduction.

S. S. Brooks

Winchester, N.H., *July*, 1922

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CHAPTER I

INTRODUCTION

EDUCATION is gradually becoming less of a custom and more of a science. A force of professionally trained educators, imbued with a determination to free the schools from the chains of mediæval traditions in subject-matter and method, and with an ambition to apply the principles of common sense to education, is being rapidly built up. The development of modern educational psychology is bringing about changes of management and method that are little short of revolutionary. The ossifying doctrine of formal discipline and a multitude of other hoary traditions have been proved invalid by the scientifically controlled experiments of experts in the psychology of learning. Thus the very foundations have been knocked from under the existing educational system, leaving it, so to speak, very much up in the air.

But if these experts were to be anything more than iconoclasts, they must furnish something better in the way of teaching aims and methods to replace the demolished idols of an educational world whose complacency they had sadly ruffled. Accordingly, they inaugurated in some quarters experimental schools and school systems—laboratories for the compounding of educational doctrines. While still very young, however, the new movement became seriously afflicted with a rash of faddism due to

under-trained but over-enthusiastic reformers who mistook their day-dreams for facts of proved worth. Having passed through this period, however, the movement began to steady itself. Earnest seekers after the truth early came to realize that to foist half-baked schemes on an ultra-conservative public would in the end merely breed distrust and suspicion of all new ideas in education regardless of their value. Reformers grew more cautious of presenting their ideas until they had proved their worth. Local school men and women also became more cautious of introducing new methods until those methods had been successfully tried out under fairly representative conditions. Thus something like a healthy balance was struck between faddism and conservatism.

Among the more recent ideas there are some that seem pregnant with tremendous possibilities for the improvement of educational procedure. The most far-reaching in its beneficial possibilities seems to me to be the idea of measuring the results of teaching and the intelligence of school children by means of standardized tests. Of large importance also are: "The Socialized Recitation," "Supervised Study," "Teaching Children How to Study," "The Project-Problem Method in Teaching," and the change of emphasis from oral to silent reading. All these things are rich with promise of greater efficiency in education. But although all the above-mentioned ideas have proved successful, when carried out by trained men and women full of enthusiasm and thoroughly understanding the psychological principles upon which the ideas were based, nevertheless, when the carrying-out of these same ideas has been attempted by persons lacking in sympathy and full understanding of the principles, aims, and methods involved, they have often been far from successful.

Superintendents and teachers who condemn these ideas, after proving to their own satisfaction that they are worthless, remind me of the first farmer in the town of my boyhood to purchase a mowing machine. For a great many years this man had mowed his many rough and rather rocky acres by hand with the help of a large crew of hired men. But one spring the mowing-machine agent appeared in our town and as a result, by the time hay was ready to be cut, the farmer found himself possessed of a brand-new mowing machine, resplendent in green, yellow, and red. The next morning he started out to mow the "back field." Truly his trials that day were many. And when the machine, unable to stand any more of his inexpert handling, broke down late in the afternoon, he had succeeded in getting over only about as much ground as one good man with scythe and snath could have mowed in the same length of time. And what an untidy-looking job it was! The next day the farmer started his old crew to mowing by hand. No more of that mowing machine for him. He could do more and better work in a day alone than could a man with a pair of horses and a mowing machine. The mowing machine was a failure. He knew because he had tried it. But did this farmer's experience with his new mowing machine prove the failure of the machine or the failure of the man? The mowing machine, we know, will do good and rapid work in astonishingly rough and rocky ground when guided by a practiced hand.

And so it is with new methods and ideas in education. The socialized recitation can easily result in chaos in the hands of weak teachers. Supervised study can become the sepulcher of all energy and initiative on the part of pupils if improperly conducted. Teaching children how to study becomes a farce when attempted by teachers who do not themselves know how to study efficiently. And

how many of them do know how to study to the best advantage? As for silent-reading — well, some of its ardent exponents would get the surprise of their lives if they sent out questionnaires to all the teachers of so-called silent-reading asking them to explain their conception of silent-reading drill.

For example, I visited a village school not long ago, where, the superintendent told me, one of his best teachers was working out some of the "new ideas." I found the teacher industriously correcting papers at her desk. The room was very quiet and orderly, and every child was busy.

"Do you teach silent-reading here?" I asked, after introducing myself.

"Oh, yes! That is what we are doing now. We have silent-reading drill for a whole hour every afternoon."

"And is that all the silent-reading drill they get?"

She looked up in surprise. "Why, yes, that seems to be as much time as we can spare without neglecting the other work. The pupils enjoy it very much," she added.

And why should n't they enjoy it? The school was well supplied with children's story-books and for a whole hour every afternoon the pupils were permitted to forget the serious affairs of life and to dawdle over story-books without aim or purpose. Was this efficient silent-reading drill, or was it largely a waste of time and money?

Now the moral of all this is that neither a machine nor an educational method should be condemned as worthless because it fails in unpracticed hands. The successful working-out of any of the things mentioned above (especially in the present state of our knowledge about them) demands energy, initiative, industry, enthusiasm, and a fairly complete understanding of the psychological principles involved together with ability to apply them. The form of a method without its spirit will not ensure success

Before introducing a new mode of procedure into a school or school system, superintendents and teachers should be sure that they know what they are going to try to do, why they are going to try to do it, and what others have done along the same line. In addition they should have a definite plan as to *how* they expect to do it. This plan may have to be changed or modified several times before results are satisfactory, but nevertheless, some definite plan should be provided at the start.

For information as to what others have done one must have recourse to educational books and periodicals. Much has been written, in one form or another, concerning supervised study, teaching children how to study, silent-reading, and standardized tests. Most of these writings, however, deal with generalities. Now, either through lack of inherent ability or through lack of proper training, it is undoubtedly hard for most people to apply general principles to specific cases; to take a suggested plan, think out the details, and put the plan into successful operation. This is the reason for such a large crop of failures when a superintendent calls his teachers together, tells them what he wants done, explains the general principles of the new plan, and leaves them to work out the details and produce results.

The research men are giving us some splendid books as a result of their years of study and painstaking experiment. Their statements of procedure are, for the most part, sound in theory; and many of them have been proved by practice — especially when conditions were favorable. But these general principles, when applied under widely different and often adverse conditions, do not always work well. There are, however, some school people who are not easily discouraged, who take the trouble to make a careful study of the causes of failure, and who modify

either the plan or the local conditions or both; and it is they who put the results of research into successful operation.

Would it not, therefore, be well if we had more printed records direct from the actual workers in the field — from the men and women at the head of local schools and school systems and from their teachers? Even if these records were not of high technical or literary merit, they would tell just what teachers and superintendents have tried to do, and why and how they have tried to do it, together with the results achieved. The story might not always be one of shining success, but could it not be valuable to fellow workers for all that? If we are truly wise, we may often learn success from others' failures. Most of us profit by reading about the experiences of others in our own line of work, even though we are sometimes foolish enough to think we have nothing more to learn.

Hence the excuse for this book. It tries to tell in a simple way how standardized tests and scales were used to improve the schools in a newly organized rural-school district in New Hampshire under conditions that were, to say the least, discouraging. In a way it is story. It is the story of how a corps of faithful, hard-working, but mostly untrained teachers, with the aid of an inexperienced superintendent, put standardized tests and measurements to practical use throughout a school system to the considerable advantage of all concerned; of how also, in connection with the use of the tests, they solved, with at least some satisfaction to themselves, the problems of efficient silent-reading drill, supervised study, and teaching children how to study, in one-teacher rural schools. It is not a story of complete and unqualified success; but I have endeavored to make it a faithful, readable, and understandable account of what was done, of why and how it was done, and of the results achieved.

The book is addressed to teachers and superintendents, both urban and rural. The principles of procedure set forth can be applied in a single school or a whole school district, in large schools or small, in city or country. The methods used have been tried out under about as unfavorable conditions as could be found anywhere. Although the actual experiments have been carried on in a purely rural district, I can conceive of no reason why the same principles cannot be applied with even greater facility, and the methods used to even greater advantage in town and city schools. Many of the obstacles that face the rural superintendent in attempting such a testing program as is here described are largely absent in the city. Better-trained teachers are available; the teaching force is more stable; and it is much easier to get the teachers together for frequent meetings.

CHAPTER II

THE PRACTICAL SITUATION[1]

A SUPERVISORY district containing twenty-six rural, ungraded one-room schools with teachers for the most part inexperienced or untrained, a majority of whom had never worked under a superintendent before — this was the opportunity that fell to my lot when I became a New Hampshire superintendent under the new law effective September 1, 1919. It was my first experience as a superintendent. Truly the district was "virgin soil" as a member of the State Department remarked to me when I took the position.

SIZING-UP THE SITUATION

THE first two or three weeks were spent in traveling about the district getting acquainted with the teachers and sizing-up the situation. Most of the schools had already begun, the teachers having been hired by the local school boards as in the past. I found that three of the teachers were normal-school graduates, and that two had attended one summer school; but the others had no professional training whatever. Several had not attended school beyond the eighth grade, but had taught from ten to twenty-eight years in the same school. Three were inexperienced high-school graduates in their teens. Fifty per cent of all the teachers had never seen a professional book or magazine and did not know where to obtain one. All this, of course, had resulted in an ingrowing provincialism which could not but have a disastrously narrowing effect on their teaching. They were imitators of imitators.

Their methods were in imitation of the teachers who had taught them and who, in their turn, had imitated their own teachers. The results were the use of methods and texts so archaic as to be amusing if they had not been at the same time such a sad commentary on our boasted educational system.

Most of the textbooks were sadly out of date. Arithmetics, geographies, grammars, and even histories published in the eighties were in daily use. One of the local committees insisted that they must be good books or they would not have worn so long. Of course the books were all based on the defunct doctrine of formal discipline and showed little of the psychological methods of presenting material which are the basis of modern educational procedure. The idea seemed to be that an arithmetic is an arithmetic, and that a geography is a geography, one book being as good as another so long as nothing pertaining to the subject is omitted and the leaves are all present.

I have emphasized the teaching and textbook situations because I consider them the most important factors. I shall mention a few other points briefly. As for the schoolhouses, it is sufficient to say that most of them were typical New England rural-school buildings of ancient vintage, modeled variously (according to the ideas of their *instigators*), upon churches, town halls, barns, and in some cases it would almost seem, upon pigpens. They were small, dirty, poorly heated, lighted, and ventilated, and in short generally unsanitary and ill-suited to their purpose. As to the organization of the schools, as I have already intimated, no attempt had ever been made to grade them. Another important factor in the situation was the attitude of the communities toward expert supervision. Three of the four towns in the district had always opposed such supervision as long as it was optional and were not in-

clined to submit gracefully when, according to the provisions of the new law, it became compulsory. Such were the general conditions as revealed by my preliminary survey.

However, there were three bright spots in the general darkness of the situation. First, the splendid new State school law which made the superintendent a State official with a pretty free hand and which provided liberal State aid for rural schools, where it might be necessary, to keep them up to the required minimum standards. Secondly, intelligent school boards willing to coöperate. And last, my own professional equipment which included a pretty thorough training in educational measurements and an earlier experience in the teaching of rural schools. Accordingly, I tackled the proposition determined to show what scientific method in education, as I understood it, could do for rural schools if it had the chance.

Analyzing the Situation

The following week was spent in analyzing the conditions found to exist and in deciding upon the most efficient way to bring order out of chaos. As a result of this analysis a number of definite problems seemed to stand out clearly demanding early attention. From among these problems I shall select, for present discussion, only those, in the solution of which, as it seemed to me, standardized tests and scales could be used to good advantage.

Problem 1. To grade the schools fairly and accurately. Getting the schools graded in order to start the pupils right for their year's work was of course the most urgent problem. It would have been a comparatively simple matter to grade them arbitrarily on the basis of the teachers' judgments. But there are serious objections to this method even as a beginning, especially when the teacher

is new to the school. If, for example, children are placed in grades lower than their parents think they ought to be, there are bound to be strenuous objections from some of these parents, and the only evidence one has to offer is that the teacher thought the children ought to be placed in those grades. Did you never hear this line of talk from an irate parent? "My John is just as smart as Mrs. Smith's Henry and he ought to be in the same class or above. It's a plain case of showing partiality. I just won't stand it!"

It is not by any means easy in such cases to prove to the satisfaction of the parent that the teacher had a sound basis for her judgment. And the fact is that she did not have a sound basis. How did she know just what knowledge or ability a child should exhibit in order to belong in a certain grade? What standards of achievement did she have for the different grades besides her own arbitrary judgment?

Giving ordinary tests for grading purposes is also inaccurate and unfair, because such tests are devised by the teacher or superintendent and hence represent merely the judgment of one of them as to what he or she thinks a child ought to know in order to be placed in a certain grade.

Worse than all else, the children themselves are apt to become discouraged, not understanding wherein they have failed, and being at a loss as to just what they are expected to achieve. Even the superintendent and teachers, if they are conscientious, are not satisfied because they cannot feel sure that injustice has not been done. Retarding a child without good reason, thus robbing him of a year of his time, is a serious matter, at least for the child.

What method of grading, then, could be found which would be fair to all concerned? After casting about for some time for a solution to this problem, it suddenly oc-

curred to me that standardized tests would help me out of my difficulty. Did they not offer definite standards of achievement for each grade? And those standards were not based on an unattainable one hundred per cent nor upon the opinions of dogmatic educators as to what a child ought to know at the end of a certain grade. They were experimentally derived and based upon the amount of work that normal children are actually doing in the different grades throughout the whole country and not upon the amount of work somebody thinks they ought to do.

By giving these tests in all my schools I thought I could determine just where each child belonged on the educational ladder. The process would be roughly comparable to measuring a large number of sticks of various lengths by means of a tape measure sorting them into eight piles, each pile containing sticks of about the same length. Then, when angry parents wanted to know why their children were graded so low, I could show them. The children themselves could be made to see wherein they had fallen below standard and what they would have to do to come up to the standard. Both superintendent and teachers would feel that they were on solid ground. Surely I needed standardized tests the first thing.

Having reached this conclusion, I immediately ordered all the tests and scales I knew of that were sufficiently well standardized for my purpose. They covered the following subjects: arithmetic, silent and oral reading, spelling, writing, geography, history, and English language.[1]

Problem 2. How to measure the progress of pupils. Having settled upon how to do the preliminary grading,

[1] For those who do not know standardized tests and want to get acquainted, I recommend for a beginning the purchase of *Measuring the Results of Teaching* by Monroe, and *Educational Tests and Measurements* by Monroe, De Voss, and Kelly. Both books describe the best tests and their uses and the former tells where to obtain them. These books are published by Houghton Mifflin Company.

the next problem was to find a just method of measuring the progress of pupils for promotion purposes. The same objections to teachers' tests hold good here as were noted in discussing the previous problem.

This problem involved, obviously, the finding of a satisfactory system of marking. It has been proved beyond doubt that ordinary teachers' marks are unfair, inaccurate, and generally unsatisfactory as a means of measuring progress or as a basis for promotion.

In measuring the progress of pupils, standardized tests must surely find their widest field of usefulness. Here the process can be compared to standing a ten-foot measuring rod beside a young tree when it is a foot high and noting its growth in height. When it has added another twelve inches it belongs in the two-foot class. Twelve inches more and it is promoted to the three-foot class, and so on. It is entirely possible to devise a satisfactory system of marking, with the aid of such tests, as will be explained later on.

Some of the teachers thought that the new State program of studies for elementary schools would be a sufficient guide for promotion purposes. This program is thoroughly practical and up-to-date. But it offers no definite, objective standards of achievement from grade to grade. Therefore it is not a satisfactory tool with which to measure the progress of pupils and to determine when they are ready for promotion. It is true that a printed program of studies specifies the subject-matter to be covered by each grade, but it is left entirely to the judgment of the teacher as to when that subject-matter is covered satisfactorily. The ground may be gone over more or less thoroughly and with very unequal results according to the methods and arbitrary standards of the individual teacher. Hence, it is obvious that programs of study

cannot take the place of standardized tests that are even fairly objective.

Problem 3. How to measure the ability of teachers. One of the greatest needs of superintendents is a method of measuring the ability of teachers that will be accurate and fair to all concerned — a method that will not leave the superintendent open to the charge of favoritism or poor judgment — a method that will satisfy a teacher who has been rated something less than "excellent" that her shortcomings are real and not hallucinations in the mind of the superintendent due to his personal dislikes and prejudices.

What is wanted is concrete evidence of a teacher's ability or lack of ability that will allay carping criticism from whatever source. It is decidedly neither accurate nor fair to estimate a teacher's ability solely by observation made by the superintendent during his visits to the classroom. It is not fair because (*a*) such observations do not furnish a sound basis for judgment; (*b*) the superintendent's opinions are quite apt to be colored by personal prejudices toward an individual teacher or her methods; (*c*) classes often show at their worst in the presence of visitors; (*d*) even the teacher may fail to do herself justice under the critical eye of the superintendent. It is inaccurate for all the reasons noted above and because (*a*) some teachers do excellent work when the superintendent is present and shirk all the rest of the time, and (*b*) if such teachers do their own testing, even the results may be made falsely to appear satisfactory.

Provided a teacher is of good moral character with high ideals and a fairly pleasant personality, her further desirability as a teacher is measured by the results she gets as determined by the progress of the pupils when such progress is objectively measured. After all, it is results

we are after, primarily. Hence, the standardized tests measure objectively both the progress of the pupils and the ability of the teacher at one and the same time.

Problem 4. To find a practical method of supervising study and of teaching how to study. This may seem like a large contract for the one-teacher rural school with its crowded curriculum, but I shall try to show that it can be successfully worked out by using proper methods of study supplemented by judicious use of the standardized educational tests and measurements.

This chapter merely presents some of the problems confronting me in my new work together with some plans for their solution and reasons therefor. The following chapters will describe in detail the working-out of these plans and the results achieved.

CHAPTER III

GETTING TEACHERS TO FEEL THE NEED FOR STANDARDIZED TESTS

Having concluded that standardized tests would greatly help me under the conditions set forth in the preceding chapter, I next attacked the problem of securing the whole-hearted coöperation of my teachers in their use. The psychology of interest teaches us that a person's best efforts are called forth only when he feels a real need. So I set myself to arouse in my teachers an enthusiastic interest by bringing them to feel a real need for definite standards of accomplishment in school work. In order to make them feel this need deeply, something more than merely telling them of the tests and their uses was necessary. They must be made to realize the inadequacy of ordinary methods of measuring the results of teaching.

Accordingly, I called a series of teachers' meetings on four consecutive Saturday afternoons. In a district more than twenty miles square it is not easy to get all the teachers together at one place. I succeeded, however, in persuading two automobile owners in each town to take the teachers to these four meetings at a price that would little more than pay for the gasoline consumed. Whether or not this scheme could be worked in other districts would depend, of course, on the character of the automobile owners and the success of the superintendent in convincing them that they ought to be willing to do it in an emergency and for the welfare of the schools.

The First Meeting

At the first meeting I outlined briefly what I wanted to do and why, and then suggested that we try some practical experiments. The first experiment was intended to prove the inaccuracy of teachers' marks in general. A few days before, I had selected the paper turned in by a sixth-grade pupil in a regular arithmetic test given by one of the teachers. This test contained the usual ten problems and was supposed to measure knowledge of percentage. A hektographed copy of the pupil's paper was given out to each of the twenty-four teachers. Then, without warning them of my purpose or of what the results were apt to be, I asked them to correct the paper and mark it on a percentage basis. When all had finished, the papers were collected and I at once tabulated the ratings on the blackboard with the result shown in Table I.

TABLE I. DISTRIBUTION OF THE RATINGS OF A SIXTH-GRADE ARITHMETIC PAPER

Ratings	*Frequency*
90–94	3
85–89	8
80–84	6
75–79	4
70–74	2
65–69	1
Total	24

The effect was striking. Nearly everybody had caught the idea and the expressions on the various faces showed me that there was no need of rubbing it in by pointing out the moral. Aroused interest was evident as I passed the papers back with the suggestion that we analyze the methods of marking to discover the factors which produced such evident lack of agreement. We finally agreed on the following points:

1. Most of the teachers had aimed to mark the pupil's response to a problem entirely wrong if the answer was wrong, without regard to correctness of principle.
2. Some gave half credit if the principle was right and the answer wrong.
3. The majority marked answers entirely wrong if a decimal point was omitted or misplaced, while some gave varying degrees of credit, if the digits of the answer were correct and the decimal point misplaced or omitted.
4. A few had assigned weights to the various problems on the basis of their own judgments with far from uniform results. This factor actually seemed to have been the one which had produced the most extreme variations in the marking.

Then some one suggested that we try it again and see if we could not do better. Several others seconded the idea, so I passed around copies of an eighth-grade pupil's history paper. Never did teachers work more seriously than did those teachers for the next fifteen or twenty minutes. The papers were then collected and the marks tabulated as before with the results shown in Table II.

TABLE II. DISTRIBUTION OF THE RATINGS OF AN EIGHTH-GRADE HISTORY PAPER

Ratings	*Frequency*
90–94	1
85–89	3
80–84	10
75–79	5
70–74	2
65–69	3
Total	24

Then followed a lively discussion, as a result of which the following important conclusions were unanimously agreed upon:

1. That teachers' marks are ordinarily very apt to be inaccurate.
2. That, due to the personal standards of the teacher and to individual marking systems, the work of the same child may be graded very high by one teacher and very low by another.
3. That such irresponsible rating may work serious injustice to the children.
4. That the work of different schools cannot be accurately compared under such conditions.

And best of all, these conclusions were mostly arrived at by the teachers themselves with the help of a few leading questions on my part. Was it worth while? Would those teachers ever again correct test papers with the same self-satisfied assurance of the infallible justice of their marks? Would they ever again feel fully justified in retarding a pupil because he had been given a mark of 68 when the passing mark was 70?

It was now time to bring the meeting to a close. Several wanted to know what better method of marking could be found. I advised all who were interested in solving the problem to order at once Monroe's book, *Measuring the Results of Teaching*,[1] and to think the matter over until our next meeting.

The Second Meeting

In preparation for the next meeting I made a list of twelve history questions on the events leading up to the American Revolution. The questions were as follows:

1. How were laws made for the colonies?
2. What sort of governments had the colonies?
3. How was the commerce of the colonies regulated?

[1] Monroe, Walter S., *Measuring the Results of Teaching*. Houghton Mifflin Company.

4. What kind of a king was George III?
5. What was the Stamp Act?
6. What were the objections to it?
7. What was the Stamp Act Congress and what did it do?
8. How did the British try to keep the colonists in order?
9. What friends had the colonists in Great Britain?
10. What was the Act of Association?
11. How was it enforced?
12. Distinguish between the real and the apparent reasons for the Revolution.

When we were again assembled I passed two copies of this list to each teacher with the request that they rank the questions one, two, three, etc., in the order of their difficulty beginning with the easiest, and that they write these ranks opposite the questions on one of the papers which they had received. When they had finished, I asked each teacher to read the ranks she had assigned to the questions beginning with question one, while I tabulated them on the board in such a way that vertical columns would show the various ranks assigned to the same question and horizontal rows the ranks assigned to all the questions by each teacher. I regret that I have lost my copy of the original table, but the general arrangement (for four teachers only) is shown below without the correct figures.

Teachers	*Rank assigned to each indicated question*											
	1	2	3	4	5	6	7	8	9	10	11	12
A.........	6	4	2	7	9	12	3	8	5	1	10	11
B.........	2	7	11	3	9	10	4	6	12	5	8	1
C.........	5	12	8	3	10	4	7	1	6	11	9	2
D.........	1	5	12	4	6	9	11	7	8	2	12	3

The tabulation, which I had made on the blackboard, showed such wide variations in the ranks assigned to the same question by different teachers, that a lively interest was aroused. In the ensuing discussion further conclusions were reached which may be summed up as follows:

1. That if a test is to measure accurately a pupil's knowledge of the ground covered, the questions must be so selected as to bring out the most important ideas in the subject-matter.
2. That there should be a large proportion of thought questions in order to call for something more than a parrot-like repetition of memorized facts, so that the better students may be enabled to demonstrate their superior reasoning abilities.
3. That some accurate method of weighting the questions must be used if accurate measurement of pupils' abilities and knowledge is to be expected.
4. That the weighting of questions by individual teachers on the basis of their personal judgments is mere guess work, since, as was shown by our experiment, they cannot even judge accurately the relative difficulty of questions.
5. That the average of the judgments of a number of teachers is apt to be more accurate than the judgment of a single one.

In line with this last conclusion we then proceeded to find the average rank assigned each question and, with these averages as a basis, to rank the questions according to their relative difficulty as determined by the combined judgments of the teachers. Next I asked them to use these ranks as a guide and to assign values to each question so that the sum of the values would equal one hundred. It was observed that for each question the variations in values were not as wide as the variations in ranks had been. This was attributed to the fact that the order of difficulty used as a guide and the limit of one hundred

placed on the sum of the values would necessarily permit much less variation. The average results are shown in Table III.

TABLE III. WEIGHTS ASSIGNED TO TWELVE HISTORY QUESTIONS ACCORDING TO TEACHERS' JUDGMENTS

Question No.	*Average estimated rank*	*Average estimated value*
1	8	10
2	4	4
3	9	12
4	1	1
5	7	9
6	5	7
7	2	2
8	6	8
9	3	3
10	11	14
11	10	13
12	12	17 Total...100

The lesson of the day had been so well assimilated that some one suggested that since the ranking of the questions by each individual was all guesswork as proved by our experiment, then our averages were only averages of guesswork and hence likely to be far from reliable. For her part she did not see that we had any real proof that question twelve, for instance, was any harder than question three, and more than that she did n't see how we were going to prove that it was. Then came what I was hoping for, but hardly expected.

"The eighth grades have recently completed their study of the period of history which the questions cover. Why not give them as a test to these grades and so find out which questions are hardest?" This from a bright girl who had attended one summer session at Plymouth Normal.

"How could you prove which questions are hardest by doing that?" I asked.

"Why, if the questions were given to a large number of pupils, would it not be safe to conclude that the one which is missed the most times is hardest and that the one missed the next largest number of times is the next hardest, and so on?"

The practical side of this suggestion appealed to the majority of the teachers at once and they were eager to try it. Since this was the very thing I had intended to propose in order to get material for discussion at our next meeting, you may be sure that I was not slow in taking advantage of their enthusiasm. So it was decided to give this list of questions as a history test to all the eighth-grade pupils in the district. The teachers were to bring the corrected papers with them to the next meeting.

The Third Meeting

I watched the faces of the teachers as they gathered for our third meeting. The dazed look had passed from most of them by this time and a look of intelligent comprehension was taking its place. The books which they had ordered at my request had arrived during the week and they had been reading them. They were apparently beginning to get their bearings. There was a business-like air in the way they took their seats and prepared for the afternoon's work that augured well for the future.

The meeting having been called to order we began to investigate the results of the history test. It had been given to 106 pupils. As I called a question by number, each teacher told me how many times her pupils had missed it. I wrote the figures on the board, a column for each question. When the results had all been read they were summed and tabulated as in Table IV.

This table showed that question four was the easiest since it was missed the least number of times and that

TABLE IV. RANK OF HISTORY QUESTIONS IN DIFFICULTY BASED ON NUMBER OF TIMES MISSED

Question No ...	1	2	3	4	5	6	7	8	9	10	11	12
Times missed ..	28	44	40	8	23	20	35	29	16	60	56	51
Real rank......	5	9	8	1	4	3	7	6	2	12	11	10

question ten was the hardest since it was missed the greatest number of times; also, that question ten was seven and a half times as hard as question four because it was missed seven and a half times as often.[1] This would indicate that, in weighting the questions, number ten should be valued seven and a half times as much as number four. When these points had been discussed, even the teacher who was dissatisfied at our last meeting was convinced that we had found a fairly accurate method of evaluating questions.

The next step was to find values for the questions according to their relative difficulties. We first assigned to the easiest question (number four), which was missed eight times, a value of one. Since the next question in order of difficulty (number nine) was missed sixteen times, or just twice as often as number four, we gave it a value of two. Question six was missed twenty times. As twenty is two and a half times eight, this question was valued two and a half. The same method was followed throughout.

The sum of these values was found to be 51.5. Since the sum of the teachers' estimated values (Table III) was one hundred, it was necessary for comparative purposes that the sum of these values should also be one hundred. Evidently if each of them were multiplied by two, the sum of the resulting proportionate values would be 103.

[1] Statistical difficulties involving the location of the zero point were ignored.

This was near enough to one hundred for our purpose and it had the advantage of yielding whole numbers. These may be seen in the last column of Table V, which summarizes the results of our study of the history questions.

TABLE V. SUMMARY OF RANKS AND VALUES FOR EACH OF TWELVE HISTORY QUESTIONS

Question No.	*Estimated rank*	*Real rank*	*Times missed*	*Estimated value*	*Value from times missed*	*The same multiplied by 2*
1	8	5	28	10	3.5	7
2	4	9	44	4	5.5	11
3	9	8	40	12	5.0	10
4	1	1	8	1	1.0	2
5	7	4	23	9	3.0	6
6	5	3	20	7	2.5	5
7	2	7	35	2	4.5	9
8	6	6	29	8	3.5	7
9	3	2	16	3	2.0	4
10	11	12	60	14	7.5	15
11	10	11	56	13	7.0	14
12	12	10	51	17	6.5	13

After the teachers had rated a few history papers using the two sets of values, we concluded our experiments. Crude and inaccurate they were, of course; but they were not intended to contribute to the statistics of educational measurements. They were rather designed to exemplify to the teachers that spirit of scientific investigation which is so rapidly making over our school systems, and in particular to convince them that teachers' ratings as ordinarily made are unreliable. And they had served well. All but two or three of the teachers had by this time expressed their firm conviction that tests devised by teachers and rated according to individual standards were of little use in finding out a pupil's real knowledge or ability, or in determining his standing with regard to other

pupils of his age and grade. These two or three teachers no amount of accumulated evidence could convince, because everything was unalterably settled to their way of thinking before the experiments were tried. The old methods had been in use for hundreds of years and must, therefore, be better than anything new. It is useless to waste time with such people. The only thing to do is to get rid of them at the first opportunity.

A few more points were cleared up by general discussion. Some one objected that, with a passing mark of seventy, it was evident from the scores that two thirds of the pupils would fail to pass the test. This brought up an important point. Is it fair to mark pupils on a percentage basis with 100 standing for perfection? Some thought it was. Some thought it was n't. Most of them had n't thought about it at all, but since the matter was called to their attention they were inclined to think that it was hardly fair. What fairer way could I suggest?

I then explained what is meant by a median score, demonstrated with figures on the board the difference between median and average, pointed out the advantages of the median, and then proposed that we find the median score of the 106 history papers using the derived values for marking. This was found to be 65.1, to which I added 10 per cent of itself and suggested that we use the result, 71.6, as a standard score. Any child who got this score would be given a mark of 100. That is, a pupil's mark would be the per cent that his score was of the standard score. For instance, if pupil A had a score of 26, his mark would be 26 divided by 71.6 or 36. If pupil B scored 63, his mark would be 63 divided by 71.6 or 90. A pupil who scored 85 would receive a mark of 118. In using letters for marks this pupil would be marked A +. It was pretty well agreed that this method of marking would be emi-

nently fair, provided standard scores were available. The method may not be scientifically accurate; but it is certainly fairer than the ordinary method of marking on a percentage basis, and it has the advantage of simplicity.

Then some one wanted to know if we should do away with teachers' tests entirely and depend on the standardized tests altogether. We finally decided that teachers' tests should be used often by way of written reviews for the benefit of the pupils, but that the results should not have too much weight in determining the pupil's final standing. The pupils themselves, however, need not know how much or how little weight these tests might have on their grading for promotion.

Most of the standardized tests which I had ordered were at hand for this meeting. Samples of these were given to the teachers to study in connection with their new books on educational measurements. After explaining briefly the painstaking methods employed in deriving these tests and scales, I dismissed the meeting.

The Fourth Meeting

Our fourth meeting was devoted to the actual work of giving and scoring the tests. A few obvious facts were first emphasized, such as the need of accurate timing in cases where time was a factor, the fact that no help should be given the pupils other than clear and complete directions, and the fact that when directions accompanied the tests they should be followed explicitly. I also warned the teachers to beware of copying on the part of pupils; and I then proceeded to administer the tests to the teachers just as they should be administered in the classroom. As each test was finished, we corrected and scored it, each teacher correcting and scoring her own paper for practice. In this way many obscure points were cleared up. Each

teacher had seen each test given and had herself corrected and scored a sample of each test properly. They kept these corrected samples to use as models in correcting the tests which they were to give in their schools. Unless some such precaution is taken beforehand, the superintendent is sure to be surprised and dismayed when he gets the first packages of tests from his teachers. He will find that he must either return them to the teachers with time-consuming directions and explanations or go over most of them himself in order to secure accurate results. I had been through such experiences before on a small scale and intended to avoid them this time as far as possible.

Since the tests were to be given to pupils the following week, each teacher then received a sufficient supply for her school. The tests were to be corrected and returned to me by mail within ten days. Unless a definite time limit is set and strictly adhered to, batches of tests from the various schools will come straggling in for two months after they are given out. Thus a few procrastinating teachers can delay the superintendent's part of the work to a very annoying extent. In order to tabulate and study results for the district as a whole, he must have all his data in hand at one time and as soon as possible after the tests are given out. In this case I was particularly anxious to have all the tests in on time as the grading of the schools was being delayed pending the results. So I laid special emphasis on the ten-day limit.

The teachers were further warned that, although I had no reason to distrust anybody, the matter was too important to permit taking any chances. Accordingly, I proposed to check the work of each teacher by giving one or two of the tests in her school *after* she had given all of them. By comparing the results of my tests with theirs of the same kind, I could readily detect any gross careless-

ness or intentional dishonesty on the part of the teachers. There is considerable temptation for some short-sighted teachers who know that their own efficiency is being measured by these tests, to stretch the time limit or to give illegitimate aid to the pupils, or even to drill on the test itself, in the effort to make their classes show up well. Of course any intelligent teacher, knowing how the tests are used, would see the short-sightedness of such a policy, since it is evident that what might be gained on one test would be lost on the next. However, two or three such dishonest teachers may, at first, work sad havoc with the accuracy of a superintendent's final figures regarding the efficiency of his schools and teachers unless he takes some precautions to discover the culprits at the start. Hence my method of checking their work.

Above all; tests should not be permitted to fall into the hands of pupils. Since they are to be used again and again to measure progress, teachers should be impressed with the importance of safeguarding them. As fast as the papers are finished, they should be taken up to prevent possible copying of the questions or problems by the pupils in preparation for future tests. Of course, this does not apply in the case of the writing, spelling, and composition scales because of the different manner in which they are used. In fact it is well to display these scales on the walls of the schoolroom so that the pupils may try to measure their own work.

In this chapter I have attempted to give an account of how the coöperation of teachers was secured in the use of standardized tests. It may not be intensely interesting in the reading, but it was assuredly interesting in the doing. Results since have proved its value. I can recommend the general procedure to any one with a similar problem to solve.

CHAPTER IV

USING STANDARDIZED TESTS FOR GRADING PURPOSES

In Chapter III I explained how the coöperation of teachers was secured in the use of standardized tests and how the teachers were instructed as to the manner of giving and scoring them. The chapter concluded with an account of the distribution of the tests with directions that they were to be used at once in the schools. These schools, as I have indicated, were not graded. Indeed, it was the immediate purpose of this preliminary test to secure a satisfactory basis for grading them.

Supervising the Testing

During the ten days allotted to the teachers for giving, scoring, and returning the tests, I visited as many schools as possible, giving advice and help where it appeared to be most needed. Considerable time and labor were thus saved in the later tabulation of results. Moreover, this plan enabled me afterwards to avoid much of the delay incident to the repetition of tests found on examination to have been carelessly or improperly given.

Even so, it was not all smooth sailing. In spite of preliminary precautions to ensure accurate results in the shortest possible time, a number of tests had to be repeated before I could feel sure that the results were fairly accurate. The returns of two or three teachers indicated such gross carelessness or incompetence or both that I was obliged to repeat the tests in their schools myself. But since the purpose of this Chapter is to show how the re-

sults of these tests were used for grading purposes, I shall confine myself to that topic.

Converting Scores into Grades

The first step was to mark each paper with the grade corresponding to the score recorded on it by the teacher. For instance, one pupil's score on Woody's Multiplication Scale was 15. Since 15 is the standard score for grade VI, this paper was marked "6." Another pupil's score on the same scale was 16. Since 15 is the standard score for grade VI and 17 is the standard score for grade VII, this paper was marked "6 1/2." On Courtis's Silent Reading Test a certain pupil received the following scores: words read per minute, 140; questions answered in five minutes, 38; index of comprehension, 94. The standard scores for grades II–VI are given as follows:

	II	*III*	*IV*	*V*	*VI*
Words per minute......	84	113	145	168	191
Questions in five minutes	16	24	30	37	40
Index of comprehension .	59	78	89	93	95

Hence the grades marked on the paper were, for words per minute, 4; for questions answered in five minutes, 5 1/3; for index of comprehension, 5 1/2.

If teachers are instructed to keep all the tests of one kind together rather than all the tests of one pupil, this task of grading the papers is not interminable. As the teachers correct the papers, they should mark the score plainly on the front page. Then the superintendent may compare these scores with the standard scores and grade the papers correspondingly. About two days sufficed to mark the approximately two thousand papers from all the schools. The work was considerably facilitated by having on a

single sheet of cardboard the tables of standard scores for all the tests. Working at a large table with this sheet propped up in front of me, I could after a little practice ascertain at a glance the grade corresponding to any score. The advantage of such a procedure will soon become obvious to any one who attempts to mark a large number of papers with the standard scores scattered in a dozen different books and pamphlets. (By way of an aside, I wonder why all the authors of tests do not print the standard scores on the front page. It would save a lot of time for the people who use the tests.)

Devising a Graph Card

Next came the harder task of devising a method of recording results which would meet four conditions: (1) be in a form readily available for grading purposes; (2) be concrete and graphic enough to be clearly understood by teachers, pupils, and parents; (3) show on a single form small enough to be conveniently filed the standing of a pupil, a class, or a school in all subjects of the course of study for which standardized tests are available; (4) be in a form that could be used as the beginning of a continuous record to measure progress of pupils and ability of teachers.

The class record sheets and graph sheets accompanying several of the tests were carefully studied with a view to adapting them to the purpose in hand. I soon decided, however, that they were too complicated and time-consuming for practical use by the superintendent who must do all his own tabulating of results or have it done by untrained teachers. Certainly such record and graph sheets would not meet any of the last three conditions mentioned above. They could not be easily understood by pupils and parents. There would be as many sheets as there were subjects; and several files instead of one would there-

fore be required. Furthermore, such sheets do not accompany all the tests, and only two or three tests make any provision for keeping permanent records of the scores of individual pupils. Some sort of simple graphic representation that would include all the tests on a single small sheet was absolutely necessary if the scheme was to be simple enough for practical use.

After considerable experimenting, during which some of the graphs evolved resembled nothing so much as a lost trail in the desert, I finally adopted the following plan as both simple and practical. I ruled several 4×6 cards in copying ink with vertical and horizontal lines as shown in Figure 1. The vertical lines were numbered at the top to represent subjects and phases of subjects in which tests had been given. The horizontal lines were numbered with Roman numerals to represent the eight grades of the elementary school. From these originals nearly four hundred hektograph copies were made — enough for all the pupils in my schools above the first grade.

The Meaning of the Graph Card

With these forms in hand and with the papers properly graded, it did not take very long to construct a graph for each individual pupil. Figure 1 is a copy of an actual record on file in my office. It is the graph of L. D., an eleven-year-old boy in the village school, Tamworth, New Hampshire. Table VI shows the same data including the subjects and phases of subjects corresponding to the numbers of the vertical lines of Figure 1. L. D.'s grade for each test is shown in Table VI in the right-hand column opposite the name of the test. In constructing the graph a heavy dot was placed at the intersection of vertical line 1 with grade line III to indicate third-grade ability in rate of silent reading; a second dot at the inter-

section of vertical line 2 with grade line VII to indicate seventh-grade ability in number of questions answered in five minutes; a third dot at the intersection of vertical line 3 with grade line III to indicate third-grade ability according to index of comprehension; and so on until the pupil's standing in all the subjects had been properly located by dots. The dots were then connected by a

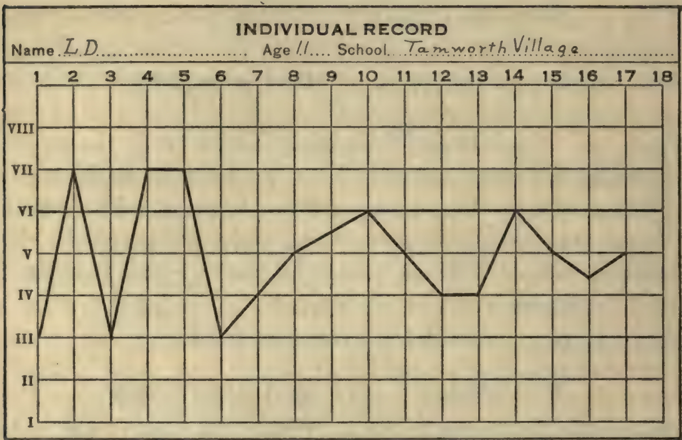

FIG. 1. SAMPLE OF INDIVIDUAL RECORD. DATA THE SAME AS IN TABLE VI

heavy line giving the graph as shown. In actual practice the grades marked on the papers were translated directly into properly placed dots on the graph card without constructing tables like Table VI. This can be done very rapidly with a little practice. Of course, for this purpose the papers should be sorted so as to get all the test papers of one child together. By this means each pupil's graph can be completed before taking up the next.

The order in which the subjects are entered on the graph

TABLE VI. RECORD OF L. D.

(See also Figure 1)

No.	*Subjects and phases of subjects*	*Grade*
1	Rate of silent reading: Courtis's Test	III
2	Writing speed	VII
3	Writing quality	III
4	Questions answered in five minutes: Courtis's Test	VII
5	Index of comprehension: Courtis's Test	VII
6	Spelling	III
7	Addition	IV
8	Subtraction	V
9	Multiplication	V½
10	Division	VI
11	Mixed fundamentals	V
12	Arithmetical reasoning: correct principle	IV
13	Arithmetical reasoning: correct answer	IV
14	Visual vocabulary	VI
15	English organization	V
16	Geography	IV½
17	History	V

card is significant. Reading is placed first because all grades are tested for reading ability. Spelling and writing follow, since they come early in school life. Then come the four fundamental operations of arithmetic, and so on, those subjects coming last which are taught only in the upper grades. Suppose the subjects were given in the following order: reading, history, spelling, arithmetical reasoning, addition, geography, etc. Then the graph of a third-grade pupil could not be drawn, since such a pupil would not be tested for history, geography, or arithmetical reasoning. The dots on the graph card indicating his grade of ability in the subjects which he does take would not be located on consecutive vertical lines. Hence no continuous line connecting the dots could be drawn. With the subjects arranged on the card in the order shown,

the graph will be complete as far as it goes, although it may extend only part-way across the card.

Using numbers to represent the subjects on the graph card is not such a disadvantage as it might at first appear to be. One very soon learns to associate the subjects with their respective numbers. The slight disadvantage experienced in the beginning is very much more than offset by the advantage of being able to use a much smaller card than would be possible if the names of all the subjects were written in.

Grading the Pupils

Next came the problem of deciding upon the grades in which pupils should be placed for the year's work. A glance at the graph for L. D. shows that he had an average of about fifth-grade ability at the beginning of the school year. In fact the average of his grade as shown in Table VI is almost exactly five. Clearly, then, since the standards are June standards, he belongs in the sixth grade for the current year. Therefore the sixth-grade line on his card was emphasized by overlining to indicate that he is a sixth-grade pupil. Then, with his name, age, and the name of the school entered as shown in Figure 1, the card was ready for filing. In the same manner a graph card was prepared for each child, his grade determined, and the card placed on file.

Within two weeks from the time the first tests were returned, a graph card had been filed for every pupil (above the first grade) in the district, and each pupil had been assigned to the grade corresponding to the average ability indicated by his or her graph. A week later each teacher had received copies of the graphs of her own pupils in order that she might see where their weak points were and govern her work accordingly.

Although in about a score of cases it was later found advisable to place a child a grade above or below that indicated by his graph, on the whole this method of grading has proved surprisingly accurate. Most of the cases referred to were those of very bright children who, on the basis of the test results, would have been advanced to a grade very much above normal for their ages. The graph in Figure 2 illustrates a case in point. This eight-year-old

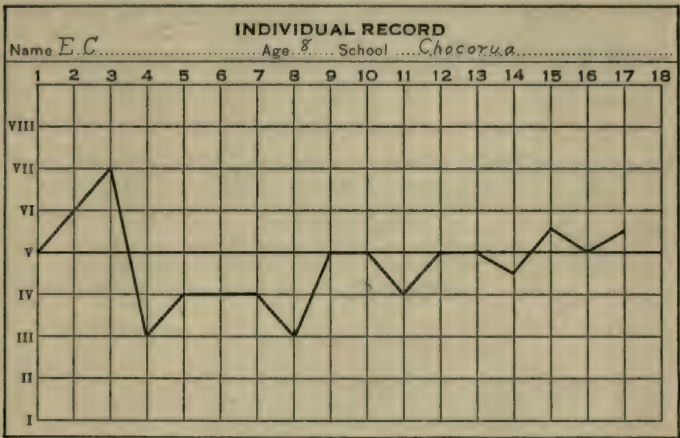

FIG. 2. SAMPLE OF INDIVIDUAL RECORD OF A BRIGHT CHILD (E. C.)

girl shows an average of fifth-grade ability. Her mental age, as indicated by the Otis Group Intelligence Scale, is twelve years. She is fully capable of doing sixth-grade work this year. However, in spite of the opinions of some eminent educators to the contrary, I cannot convince myself that it is wise to rush such children through school, especially in a district like this where the elementary school is pretty sure to see the beginning and end of their school life. Is it not better to keep them in school until they are

at least fourteen, giving them a chance to do more and harder work than their classmates of mediocre ability, and supplying them with much carefully selected informational supplementary reading to broaden their minds? There were four other cases of this kind in the same school.

This, then, is a preliminary account of how standardized tests and scales were used to solve the grading problem. I believe that any one confronted with a similar problem will find the scheme practical. Nor will the labor involved prove either monotonous or uninteresting to one whose heart is in his work.

CHAPTER V

CONDITIONS REVEALED BY THE USE OF STANDARDIZED TESTS

WHILE making out the graph cards of individual pupils for grading purposes as described in chapter IV, I gradually became conscious of certain tendencies affecting the majority of the graphs. Not only was the variation great among individuals in different subjects, but there was a certain sameness in it that struck me as being significant of fundamental weaknesses in the school system. If the graphs had been on transparent cards and had been placed in a pile, their low and high points would have tended to coincide. That is, in certain subjects most of the pupils tended to grade high throughout the district, while in other subjects they tended to grade low.

THE GRAPH CARDS DESCRIBED

IN Figures 3 to 7, the numbers at the left of the horizontal lines represent the grades, while those at the top of the vertical lines stand for the various subjects as follows:[1]

1. Rate of silent reading
2. Comprehension in reading
3. Addition
4. Subtraction
5. Multiplication
6. Division
7. Mixed fundamentals of arithmetic
8. Spelling
9. Writing, rate
10. Writing, quality
11. Arithmetical reasoning
12. English organization
13. Visual vocabulary
14. Language
15. Geography
16. History

[1] This arrangement of subjects is somewhat different from the illustrative arrangement shown in chapter IV.

In each of these figures the heavy horizontal line is drawn at the grade in which the pupil was placed as a result of the September testing. The solid lines show the grading of the pupils according to each of the tests at the beginning of the year; the broken lines show their grading at the end of the year. In interpreting these figures it should be remembered that, as before stated, the grading

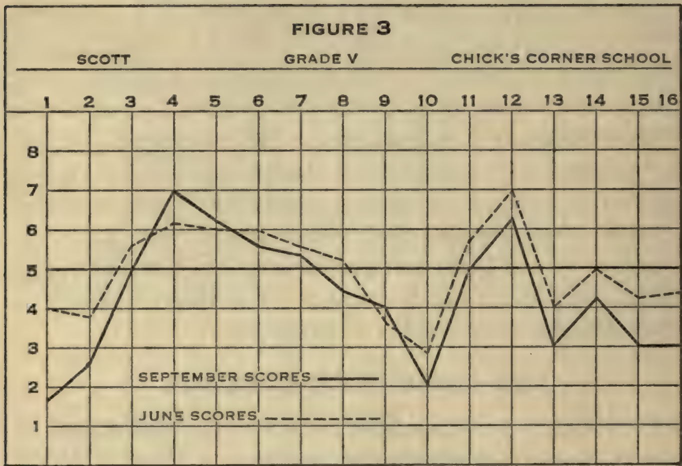

FIG. 3.

is based on June scores. In other words, if a child's score on any test equals the standard for the fourth grade, his performance is that of a child who has completed the fourth grade. Since his scores (obtained in September) indicate that he has already attained fourth-grade proficiency, he will naturally be placed in the class which is just beginning the fifth-grade work.

In Figure 3 the solid line shows the curve of Scott, a twelve-year-old, fifth-grade boy in one of the Sandwich schools, at the beginning of the year. The high and low

points are more pronounced than in most cases. The solid lines in Figures 4 and 5 are the September curves of two other pupils drawn at random from among the cards of the Madison and Tamworth schools. All three of these pupils are normal or above according to the Otis Group Intelligence Scale. The broken lines in these figures are the end-of-the-year curves.

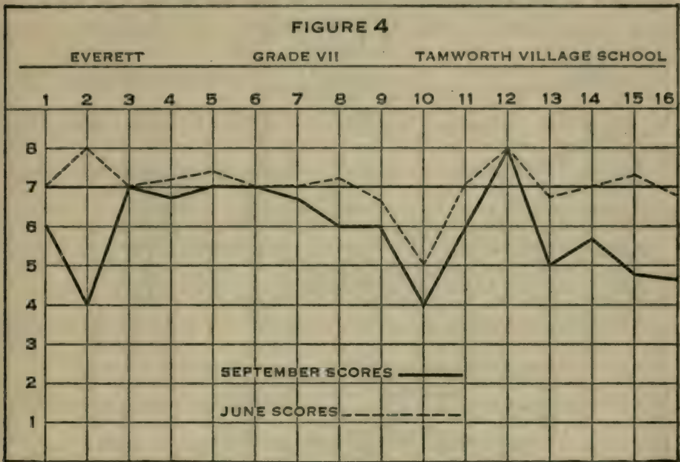

Fig. 4.

It will help in the understanding of the figures to take the case of a particular child. Consider the record of Paul (Figure 5). His score in the September test for rate of silent reading was 62. The third-grade score for rate of silent reading is 60. Accordingly, this boy showed third-grade ability in rate of silent reading in the first test. The first point on the solid line is, therefore, located at the intersection of the third-grade line with the vertical line 1. In the June test Paul's score for rate of silent reading was 97. Since 97 is midway between 92 and 102, the

standard scores for the sixth and seventh grades respectively, the first point on the broken line is located about halfway between the sixth- and seventh-grade lines on the vertical line 1.

Similarly, in the first test his score for comprehension was 12, which is somewhat below the fourth-grade standard. His score on the second tests, however, was quite equal to the standard of the seventh grade.

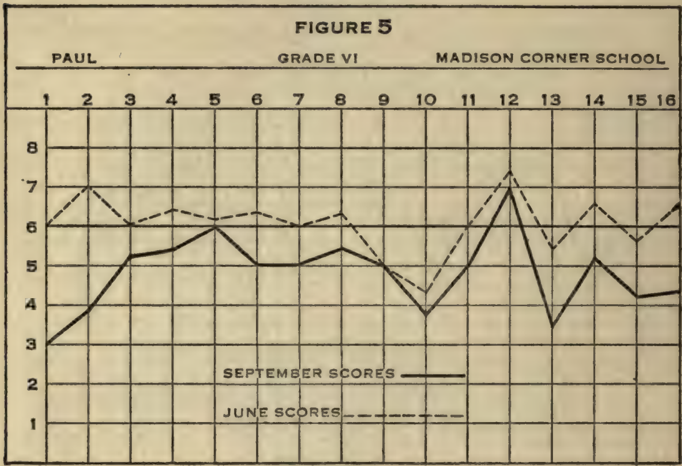

Fig. 5.

Tendencies shown by the Graphs

The reader's attention is directed to the fact that in all the accompanying figures there is a tendency for the valleys and peaks of the curve for the June test to flatten out toward the horizontal. This represents the effect of the remedial measures taken in the interim between September and June.

It will be noted that these pupils stood high in the four

fundamental operations of arithmetic (3, 4, 5, 6, and 7) and in Greene's English Organization Test (12), which is mostly a test of general intelligence. In arithmetical reasoning or problem-solving (11), spelling (8), and language (14), they were near to grade standards. In rate (1) and comprehension (2) of silent reading, in rate (9) and quality (10) of handwriting, in visual vocabulary (13), and in the content subjects (15 and 16) each of these pupils ranked from low to very low.

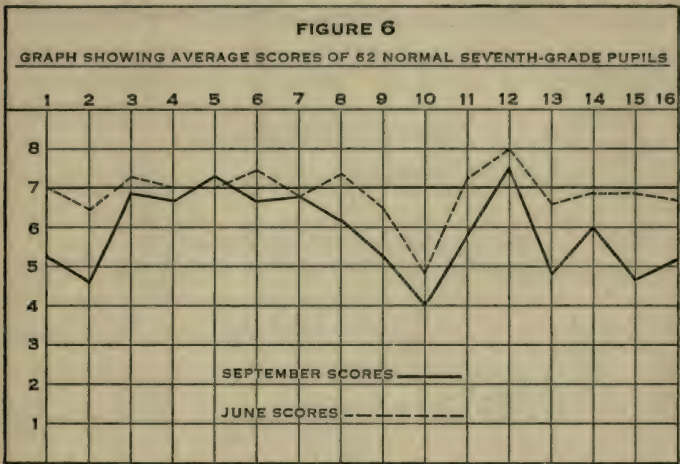

FIG. 6.

The graphs of 72.24 per cent of all the *normal* pupils above the third grade showed the same tendencies to a greater or less degree.[1] Figure 6 is a sort of composite graph of all the normal seventh-grade pupils in the district. They numbered 62. Figure 7 is a similar graph for the 104 normal fourth-grade children. These graphs were

[1] In making this study the cards of all children who ranked below normal according to the intelligence tests were thrown out.

obtained by averaging the scores of the pupils in each separate subject and using the grades corresponding to the averages to locate the points on the graphs. For example, at the September test the average seventh-grade score for rate of silent reading was 95.2. This is a little above the standard fifth-grade score of 93. Hence the first point on the solid curve in Figure 6 is located just above the fifth-grade line. Similarly, the average of all the seventh-

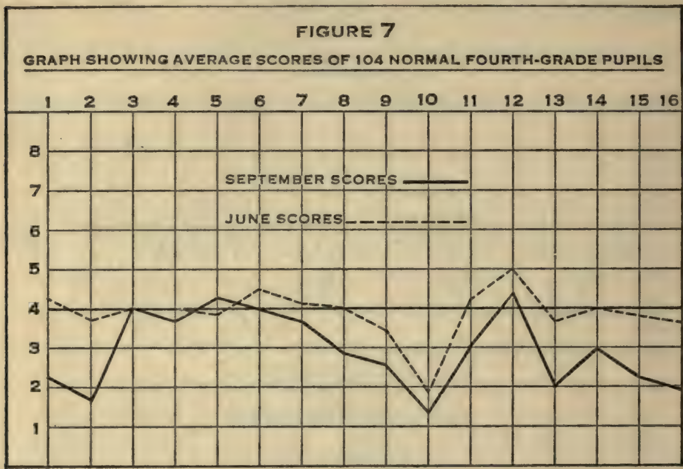

Fig. 7.

grade scores in comprehension of reading was 17.8. Since this is about two-thirds of the way from the fourth-grade standard toward that of the fifth grade, the second point is located two-thirds of the way between the fourth- and fifth-grade lines.

The Search for Causes; Over-Emphasis on Arithmetic

Having observed in the graphs these general tendencies of which I have spoken, I next made a survey of the time-

tables and teaching methods in vogue in the district in order to formulate reasonable hypotheses to account for the conditions thus revealed and in order to aid in planning remedial measures.

The universally high scores in all the tested phases of arithmetic were indicative of over-emphasis on this subject. The time-tables showed the relatively large amount of time assigned to arithmetic. The idea seems to be prevalent among teachers, pupils, and parents that arithmetic is the all-important subject. These schools are no doubt typical of the schools in small rural communities. Moreover, being widely scattered, they have little communication with each other. It would seem, therefore, that the results of this study fairly represent conditions in most of the smaller rural schools where standardized tests have not been used and where their diagnostic values have not been realized.

I am aware that these findings are contrary to those of more eminent workers who have found arithmetic to be a subject in which pupils usually grade low when measured by standardized tests. Possible reasons for this difference may be (1) that the results from *all* the pupils were considered instead of only the normal ones and (2) that their tests were given in city schools.

This over-emphasis on arithmetic in the smaller rural schools is not an unnatural condition. In fact there are sound reasons for it. In the first place, arithmetic is easier for the untrained teacher to teach than the content subjects. Fair results can probably be obtained with less mental effort on the part of the teacher in the teaching of arithmetic than in the teaching of history and geography. The work is largely a matter of drill, and drill is easy for the teacher. In the second place, teachers usually have more immediately obvious success in the teaching of

arithmetic. It is human nature to like to do the things in which we best succeed. In the third place, pupils like arithmetic (*a*) because they enjoy good lively drill work in the fundamentals; (*b*) because they do not feel quite so much "at sea" in preparing an assignment of the next ten problems in arithmetic as they do in facing an assignment of the next ten pages in history or geography or physiology; and (*c*) because children like puzzles. The older pupils especially enjoy solving the problems of this character which our textbooks abundantly supply. In the fourth place, when it is left to the children to divide their study time among the different school subjects — as has been the common custom in unsupervised rural schools — an undue amount of time will usually be spent on arithmetic. Not knowing what to do with improperly assigned lessons in the content subjects, but knowing that they must keep busy at something, children will turn to their arithmetics with which they feel most capable of doing independent work. Finally, the demands of parents on the teacher that their children be "learnt how to figger" is another factor in the situation. All these reasons coöperate in bringing about over-emphasis on arithmetic in the rural schools.

As the beginning of an attempt to remedy this condition we decided to reduce for a while the time devoted to arithmetic by one half and to use the time thus gained for subjects in which the schools were making a poor showing.

Other Tendencies

Arithmetic was the only school subject in which there appeared a general tendency to rank very much above grade. The only other markedly high spot in the graphs was that denoting their grading in Greene's English Organization Test. In this test the pupils demonstrate their ability or

lack of ability to rearrange broken sentences so as to make sense. Here is a sample of the disarranged sentences of which the test is composed:

wanted, to go home, him, the dog

Since this is largely a test of intelligence, the prevalent high scores of the pupils simply go to show that their low ratings in subjects other than arithmetic were not due to lack of mental ability, a fact also supported by their scores in the Otis Group Intelligence Scale.

The average scores for problem-solving in arithmetic were close to grade standards for each grade. The reason why the pupils did not do as well in this particular phase of arithmetical ability as they did in fundamentals will be discussed a little later. Spelling and language are other subjects in which drill work figures very prominently. Although in each of these two subjects there were wide differences between the lowest and highest scores in each grade, the averages were well up to or above standard, as shown by the solid lines in Figures 6 and 7.

The Writing Situation

Writing averaged the lowest of all the subjects in every school but one. The teacher of this school had received business-college training and was good in muscular-movement penmanship. The low averages in writing led me to make a special investigation of the methods of teaching that subject in the district. A round of observation convinced me, not only that the teaching of writing was being neglected, but also that what teaching there was had little value. The copy-book method was in use in every school except the one just mentioned. The teachers in general did not know how to teach writing. Therefore they had little success with it and did not like to teach it.

Upon inquiry as to how the writing period was conducted, I learned that in several cases at least the teacher would simply tell the pupils to take their writing-books and write for ten minutes. During this time she would sit at her desk and correct papers. At the end of the period, without even looking at the copy-books, she would tell them to put away their writing materials and go on with other work. In very few of the writing periods that I observed personally was there any adequate attempt to teach the children how to write. Is it strange that the writing scores were disgracefully low? I wonder if this condition is typical of schools in smaller rural communities with untrained teachers, or is it a specialty in this district?

In an attempt to remedy the condition I tried to arouse the teachers to its seriousness, and I introduced a method of business writing into all the schools. This was somewhat of a venture, since most of the teachers had had no training in muscular-movement writing. However, they were all informed regarding the correspondence course for teachers conducted by the publishers of the system, and were encouraged to take it. Several of them did so, and by the end of the year they were doing passable work as teachers of the new method.

As a result of this radical change the writing conditions in the schools are now in a somewhat chaotic condition. It takes time to break up the old finger-movement habits and perfect new ones. Hence the graphs show little improvement in writing scores for the year. We hope, however, that during the coming year a continuation of our efforts will produce definite improvement in the quality of handwriting.

The chief difficulty seems to be to get the children to use the muscular movement outside of the period of writing drill. Hereafter, in order to further our efforts, no

written work will be accepted unless it is done with muscular movement. We believe it is largely a waste of time to compel a pupil to write with muscular movement for ten minutes a day and then to let him use finger movement in writing his compositions.

Poor Results in Reading, and Why

The reading scores were also scandalously low. Both the individual graphs (Figures 3, 4, and 5) and the grade graphs (Figures 6 and 7) exhibit this fact in a striking manner. Analysis of the situation furnished several quite probable reasons for the poor showing in silent reading.

First, the pupils had not been taught silent reading. The reading drill in the schools was, and always had been, oral. Only two or three of the teachers had any conception of what is meant by silent-reading drill. The oral reading was conducted in the old-fashioned way which needs no description — and mostly in a slipshod manner at that. The fact that the children were tested for silent reading when all their class work had been in oral reading was probably the chief reason for the low scores.

Second, in most of the schools there was only one set of readers for each grade. The younger pupils knew most of the stories in the upper-grade books from hearing them read over and over by the older pupils. The fact that they knew the gist of these stories long before they ever reached the grades in which the books were used, that they had " studied " the lesson over several times at their seats (perhaps), and that each pupil was provided with a book in class, precluded any chance for real, live interest in the class work. Many of the teachers, even, did not seem to be over-enthusiastic.

Third, the low scores resulting from the use of Thorndike's Visual Vocabulary Tests indicate that lack of word

knowledge probably accounted to a large degree for the poor results in reading. It may well be that the narrow range of reading, due to lack of variety in books and to the conspicuous absence of school libraries, was responsible for the limited reading vocabularies of the children.

In the light of the above-described conditions the low scores in content subjects need little explanation. Success in history, geography, etc., depends on ability to study effectively. Efficient study is efficient silent reading. Even in arithmetic, much if not most of the difficulty encountered by the pupils in solving problems lies in their inability to read and understand them as they appear in the text. Poor ability in silent reading, then, helps to explain why the scores in the problem-solving phase of arithmetic were so much lower than those in the fundamental operations.

A New Policy as to Reading

These matters were brought to the attention of the teachers. They readily concluded that reading is the most important subject in the school, because upon it depends success in most of the other subjects. We therefore decided to give reading a place in the program commensurate with its importance. For the rest of the year most of the reading time was devoted to intensive drill in silent reading. Different methods of conducting this drill were devised in order to furnish variety and in order to keep interest alive. Much of the work in geography, history, physiology, civics, etc., was taken up as class drill in silent reading. Oral quizzes every few days by way of review in these subjects took the place of the customary daily question-and-answer recitation. In this way the time usually available for reading drill was quadrupled.

Did so much reading drill get monotonous? The chil-

dren will testify that it did not. Did the content subjects suffer from giving up so much seat study and question-and-answer recitation? The graphs clearly indicate the answer.

We adopted also a definite policy of vocabulary building. New words were constantly introduced to the pupils by psychological methods. They were introduced as the names of ideas after the ideas themselves had been vividly brought to their attention by objects, pictures, or lively descriptions.

The number of reading books in the schools was multiplied by ten or twelve, and a generous beginning of school libraries was made. For the most part the new books were informational rather than merely entertaining. Yet they were books that appeal to children — and, indeed, they did appeal to them. Our difficulty now is not in getting the pupils to read, but in getting them to do anything else but read.

What did it all amount to? Well, look at the broken lines in the preceding figures. They speak for themselves. They are the graphs of the same pupils and of the same grades at the end of the school year.

CHAPTER VI

MEASURING THE PROGRESS OF PUPILS BY MEANS OF STANDARDIZED TESTS

Teachers' Judgments of Progress Unsatisfactory

From time out of mind the estimate of a pupil's progress in his school work has been left to the more or less excellent judgment of his teacher, a judgment often warped by personal prejudice due to his behavior in school, his personal appearance, or his father's standing in the community. The fact that the teacher gave tests and ranked the child on the quality of his reactions to them does not necessitate a modification of the above statement. For those tests were based solely on what she *judged* the child ought to know concerning the various school subjects as a result of her particular line of instruction. She had no way of *knowing* definitely what a child of his age and grade really ought to know in order to be as well informed as other children of his age and grade in other schools. Even the grading of the papers, after they were corrected, was mostly a matter of judgment, as has been previously shown.

Some of the more unthinking teachers took the testing and grading very seriously, marked the papers very carefully on a percentage basis, and then " passed " the pupil or " flunked " him according to whether his mark was 70 or only 69. Others, realizing more or less vaguely the injustice of such a procedure, graded the pupils' work as excellent, good, fair, poor, or very poor, which they could probably have done just as accurately without giving any tests for grading purposes at all.

Standardized Tests used to Measure Progress

But there is no longer any valid excuse for such haphazard methods of measuring the results of teaching in elementary schools. The standardized tests and scales furnish us with definite norms of achievement by means of which we can compare any child's work with the median or average for his age or grade and decide justly as to whether or not he is making normal progress.

One of my purposes in using tests has been to measure the progress of pupils in their studies. Thus far[1] we have given the tests four times in all the schools of the district. They have been given at intervals of several months so as to permit progress between tests to show plainly in the graphs. Three of these test periods — the ones particularly of interest in this chapter — fell within the school year 1919–20. All of the data from these several tests were graphically recorded and filed. The records are very interesting and highly satisfactory so far as proof of the efficiency of this method of measurement of progress is concerned, although, of course, they do not always show satisfactory progress on the part of the pupils.

As heretofore stated, our plan is to give standardized tests in as many of the elementary-school subjects as possible to all the pupils in the district three times a year. They were given first in September, 1919, for grading purposes and to get a starting-point from which to measure progress. In February, 1920, the tests were given again in order to find out how the pupils were progressing and particularly to discover along what lines, if any, unsatisfactory progress was being made, so that the teachers might see where increased effort or change of method

[1] This chapter was written some time after the preceding chapters.

was needed. In June, 1920, they were given a third time for promotion purposes.

The scores of the individual pupils in these tests were first recorded on 4 × 6 cards in the form of graphs. Each time a new test was given a new graph was drawn on each pupil's card in a different color, so that at the end of June I had, for each pupil in the district above the first grade, a graph card which showed at a glance his standing in all the subjects tested for three different periods in the school year. Each teacher had duplicate cards for the pupils of her particular school.

The Graph Card

More recently, however, I have devised and had printed a 5 × 8 graph card which is considerably more convenient than the makeshift in use last year.[1] The graphs reproduced in this chapter are shown on the new form (Figures 8 to 11). This new card contains not only the names of the tests, but also the standard scores for each of them. Directly below the name of each test is a vertical line upon which the standard scores for that test are printed at the intersections of the vertical line with the horizontal grade lines. For instance, the sixth-grade standard score for comprehension in Monroe's Silent Reading Test is 21. Accordingly, this number is printed at the intersection of the sixth-grade line with the vertical line below " Comprehension " and under the name of that test. The fourth-grade standard score for Woody's Division Scale is 5. The figure 5 is therefore printed at the intersection of the fourth-grade line with the vertical line directly beneath "D" under "Arithmetic-Woody."

[1] A still more recent edition of these cards has been published as the "Brooks Individual Graph-Record Card." These cards may be obtained, in any desired quantity, from the J. L. Hammett Co., Cambridge, Mass.

Since in the Ayres Spelling Scale and in the Hahn-Lackey Geography Scale the standard scores for any particular grade vary with the column used for testing, no scores could be printed for these tests. So, merely for convenience, the Roman numerals marking the grade lines were repeated at their intersections with the verticals for these two tests. The lowest score on any test line shows the lowest grade in which that test is given. For example, Woody's Division Scale is not given below the third grade. Hence, the lowest score for this test (3) is on the third-grade line. Similarly, Starch's History Test is not given below the sixth grade.

Figures 8, 9, and 10 are copies of the graph records of three different children for the school year 1919–20. All three were taught by the same teacher throughout the year. The graphs are given with explanations and comments for the purpose of showing a method of recording results so as to indicate at a glance how the pupils were progressing in their school work and when they were ready for promotion.

The Record of a Child of Average Mentality

Figure 8 shows the record of an eleven-year-old girl of about average mentality. Her mental age (M.A.) was eleven years, seven months, and her intelligence quotient (I.Q.) was 105. Hence she is a little above the average in intelligence. Her graph, resulting from the September tests and represented by the dotted line in Figure 8, falls about equally above and below the fourth-grade line. That is, she averaged about fourth-grade (end of year) ability in the tested subjects at the beginning of the school year. Hence she was placed in the class that was beginning fifth-grade work, namely, the fifth grade according to the plan discussed in chapter IV. The dashed line

represents the scores of the same child from the February tests and the solid line those from the June tests. The progress of the child in her studies is shown by the higher levels of the graphs for the later tests. Only two subjects show little or no increase and those will be explained a little farther on.

Reading. Let us consider separately the progress made by this pupil in each subject, beginning with reading. I depend mainly on Monroe's test for measuring silent-reading ability. It is well standardized, perfectly objective, eliminates the memory factor, and is, to my mind, best fitted for my particular scheme. The pupil's score for rate of silent reading in September was 80. The first point, therefore, on the September curve was plotted at the intersection of the fourth-grade line with the test line, 80 being the fourth-grade standard score as shown on the card. Her score for comprehension was 17, which is halfway between the standard scores for the fourth and fifth grades. Hence the second point on the September graph is located halfway between the fourth- and fifth-grade lines. Now note the space between the two points just located and the corresponding points on the dashed curve. This space shows the progress made by the pupil in silent reading during the first half of the school year in relation to normal annual progress represented by the distance between the two grade lines. The advance in rate of reading is particularly marked, covering as it does the space of a grade and a quarter in a half-year. The advance made in comprehension is normal; that is, a half-grade of progress in a half-year of work.

As shown by the corresponding points on the solid-line curve, the pupil's rate of reading increased very little during the last half of the year, while progress in ability to comprehend what was read continued to be normal. The

rapid increase in rate of reading was undoubtedly due to the special emphasis placed on efficient silent-reading drill which was inaugurated in the fall term and continued throughout the year. There had never before been any such drill in any of the schools. For the year, this child's progress was a grade and a half, or fifty per cent above normal, in rate of reading and just a grade, or normal, in comprehension.

Arithmetic. On the addition line, note the drop of the February curve below the one for September. There might be several reasons for this, the most plausible being that the child was tired or not feeling well at the time that particular test was given in February. This surmise is supported by the fact that she " came back " strong in the June tests and showed a half-grade of progress for the year in addition ability.

Little progress was shown in subtraction ability; none at all for the first half of the year. But you will note that she was already up to fifth grade in both subtraction and addition at the beginning of the year. When a child's graph shows that he is well up to or above grade in any subject, the time and effort of that child is diverted to some subject in which he is below grade. One of the chief values of the tests is their diagnostic value in showing up the weak and strong places in the work of pupils or classes so that the teacher and superintendent may know where their efforts should be concentrated in order to bring about results as nearly uniform as possible. The tendency of the graphs to flatten out and more nearly approximate a straight line toward the end of the year is the direct result of this policy of placing the emphasis where it is most needed, the places where it is most needed being indicated by the earlier graphs. The ideal curve would, of course, be a straight line, denoting ability exactly equal to the

grade norms in all subjects. And an ideal year's record for a fifth-grade pupil would be three straight lines, the first coincident with the fourth-grade line on the card, the

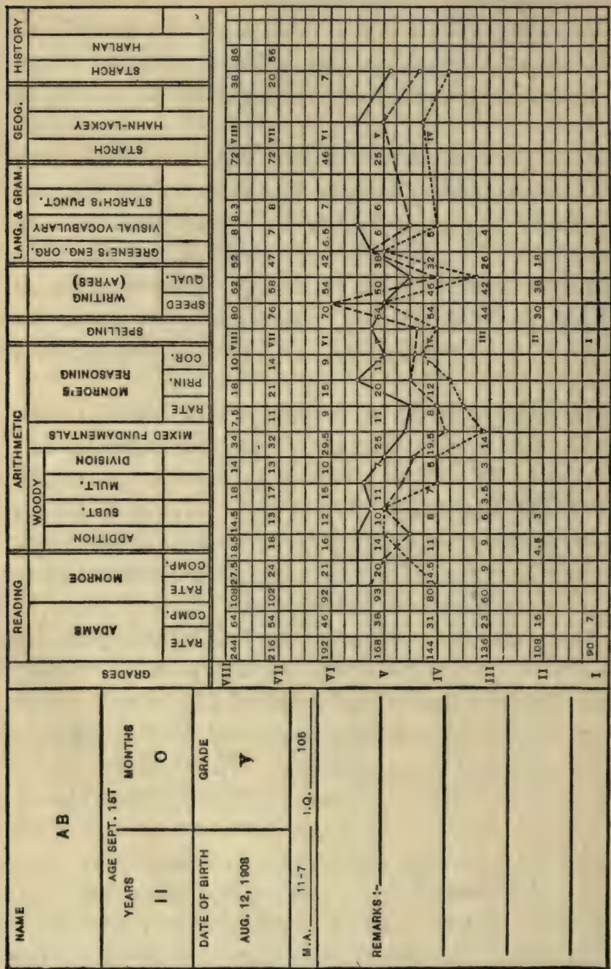

FIG. 8. RECORD OF AN ELEVEN-YEAR-OLD GIRL OF AVERAGE ABILITY. THE DOTTED LINE REPRESENTS SEPTEMBER SCORES; THE DASHED LINE, FEBRUARY SCORES; AND THE SOLID LINE, JUNE SCORES

third coincident with the fifth-grade line, and the second midway between and parallel to the others. Such a record would denote absolutely even and normal progress for the year.

One of the tests given in the fall was the Cleveland Survey Test in the fundamental operations of arithmetic — a test which is excellent for purposes of diagnosis. This test showed this particular pupil to be especially weak in the multiplication and division of fractions, decimals, and denominate numbers. Special corrective drill on these phases of arithmetic was responsible for the splendid progress shown on the multiplication and division lines.

Note the very low score made in the mixed fundamentals test in September, the excellent progress made during the year, and the fact that in spite of such progress the pupil failed to come up to grade at the end of the year. It is noteworthy that only eight pupils in the whole district have so far succeeded in getting as high grades in this test as they averaged in the four fundamental operations, although the test is made up of a mixture of the identical examples used in the addition, subtraction, multiplication, and division tests. Most of them fall below from half a grade to a whole grade. A study of Figures 9, 10, and 11 reveals the same facts concerning the results from this test. Although good progress is made in every case, the pupil or class persistently grades lower in this test than in the others on fundamentals of arithmetic. To my mind this indicates that the standard scores for this test are too high.

Continuing the examination of Figure 8, we find Monroe's Reasoning Test in Arithmetic to be the next in order. This test is scored for three things: rate of solving problems, solutions correct in principle, and correct answers. Good progress is shown for the year in all three although

the pupil fails to reach the grade standard for speed in solving problems.

Spelling. In spelling ability the pupil accomplished twenty-five per cent more than a normal year's progress, with nearly four times as great progress made in the last half of the year as in the first half. And here is a chance for some more interesting comparisons of the graphs on the different cards. Figure 9 shows no progress in spelling in the first half; Figure 10 shows the same; while Figure 11, which is the record of a whole fifth grade, shows considerably more progress in the last half than in the first. The midyear tests revealed the fact that spelling work in general was progressing unsatisfactorily. As remedial measures, oral spelling drill, together with Buckwalter's *Comprehensive Speller*, was thrown into the discard. Ayres's Spelling Scale, supplemented by individual spelling lists made up of troublesome words from the pupils' own written vocabularies, was made the basis of the spelling course. A little booklet containing graded lists of 1600 "Common Blunder Words" was also used in most of the schools. Spelling lessons were shortened; new words were presented by a more psychological method; and the recitation consisted of a written lesson wherein the pupils use the words of the day's lesson in sentences or in a short composition. The efficacy of these changes in subject matter and method is strikingly evidenced by the greatly increased progress during the last half of the year.

Handwriting. Next comes handwriting. This pupil's scores in writing (Figure 8) are typical of the general conditions revealed by the tests as discussed in chapter v; speed scores up to or much above grade and quality scores very low. Although this pupil showed considerable progress for the year, she failed to reach the grade standard in quality of handwriting. But she did better than most of the

pupils in this respect. Note that, throughout the year, her speed decreased while her quality increased. In the past, speed had been attained at the expense of quality. Now quality has been gained at the sacrifice of speed, and yet speed has not been reduced below the grade standard. Figure 9 also shows the fact that quality improved at the expense of speed. In most other cases, however, speed increased at approximately the same rate as quality, and the pupils were about as far behind in writing at the end of the year as they were at the beginning. All four of the records presented in this chapter show an improvement in handwriting for the year considerably above the average for the district. In general the improvement in writing ability was small. The reasons for the conditions found to exist at the beginning of the year and the general lack of progress during the year have already been discussed.

English. As for language and grammar, so far as the author is aware, no satisfactory general test or scale has been standardized. One of our greatest needs at present in carrying out a complete testing program in the elementary schools is a general language and grammar test somewhat on the same plan as the Hahn-Lackey Geography Scale. Starch's Punctuation Scale is good for measuring ability in that particular. Charters Diagnostic Language and Grammar Tests are excellent as far as they go, and they cover pretty well the common errors in the use of the English language. But no standards were available for them last year, so that they did not fit into a scheme which required tests that have been fairly well standardized.[1] Hence we could do little in testing language and grammar ability last year. The two tests used, namely, Greene's English Organization Test and Thorndike's

[1] Standard scores for these tests are now available and we are using them as a part of our testing program.

Visual Vocabulary Test might perhaps more properly be placed under the head of reading. The English Organization Test proved rather unsatisfactory. It does not seem to measure any definite ability. Its chief value seems to be in indicating, to some extent, a pupil's general intelligence or general reasoning ability, if there is such a thing, and even in this I have not found it to agree very well with the results of regular intelligence tests.

The vocabulary test, however, has proved very valuable, especially in interpreting silent reading scores. There is a high degree of correlation between the scores in the vocabulary test and those of comprehension in silent reading if the scores of children much below normal are thrown out. When a normal child fails in comprehension of silent reading, an examination of his vocabulary scores will often show a serious lack of word knowledge, which can be remedied by a definite plan of vocabulary building. To such a policy is due the excellent progress as regards vocabulary knowledge shown by the pupil represented in Figure 8. This progress is shown by the curves to be from fourth-grade ability in September to halfway between fifth- and sixth-grade ability in June. Notice that this is also the highest point reached in the silent reading scores. This test likewise measures the efficiency of whatever method of vocabulary building may be adopted.

Content subjects. Highly satisfactory in amount and uniformity was the progress in geography and history, as shown in Figures 8, 9, and 11, although for some reason the history scores persistently lagged behind those in geography.

General progress. As before mentioned, Figure 8 is the record of a pupil a little above the average in intelligence and her record shows on the average, a little more than a normal year of progress; which is as it should be. Further-

more, her progress was in the direction of a more uniform ability in all subjects. The June curve is 35 per cent shorter than the September curve as shown in Figure 12 (*a*), thus approaching much nearer the ideal curve. This fact exemplifies the value of corrective measures based on diagnosis by standardized tests.

These records are also used for promotion purposes. When a child's graph has moved upward over a space approximately equal to the distance between two grade lines he is ready to be promoted to the next grade. As before stated, the pupil whose record is shown in Figure 8 was started on fifth-grade work at the beginning of the school year. Her graph has moved upward, as shown by the solid-line curve, until it averages better than fifth grade. This shows that she had attained fifth-grade end-of-the-year standards in June and was ready for promotion to the sixth grade and to begin work in that grade the following September.

The Record of a Bright Child

Figure 9 shows the record of a very bright eleven-year-old girl with a mental age of fifteen years and an I.Q. of 135. Although her graph showed an average of sixth-grade ability at the beginning of the year, it was considered wisest, because of her youth and because of various changes in the course of study, to have her take the regular sixth-grade work for that year and to prepare herself for double promotion by taking part of the seventh-grade work. Her chart shows a progress of from half a grade in rate of silent reading and spelling to two and a half grades in multiplication. In the June tests, as shown by the solid-line curve, she averaged halfway between seventh- and eighth-grade standards and was promoted to the eighth grade. Whatever of seventh-grade work she did

not take along with the sixth-grade work, she will take up in the eighth grade, thus losing nothing of subject-matter and gaining a whole year's time. Figure 12 (*b*) shows the

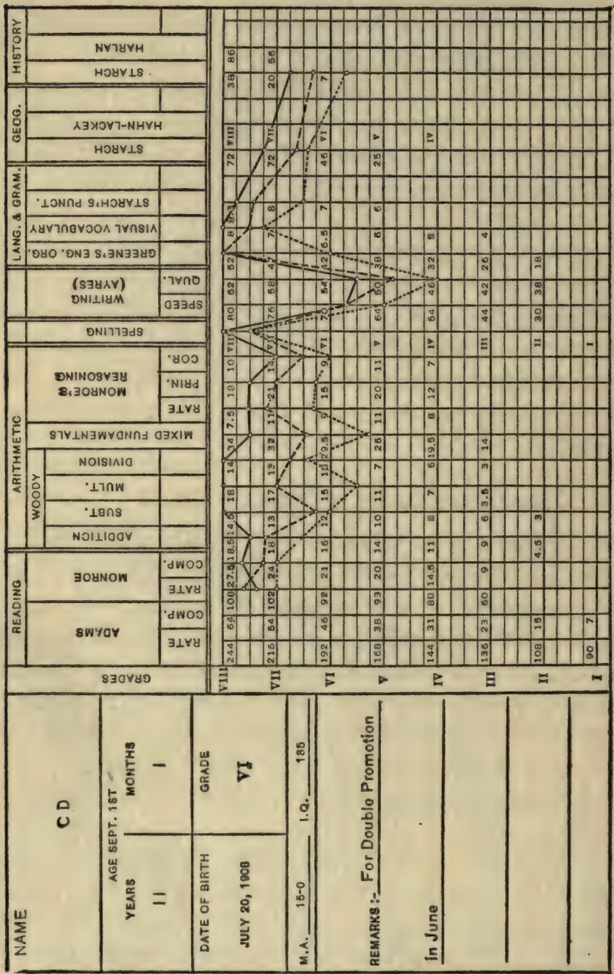

FIG. 9. RECORD OF A BRIGHT ELEVEN-YEAR-OLD GIRL. THE DOTTED LINE REPRESENTS SEPTEMBER SCORES; THE DASHED LINE, FEBRUARY SCORES; AND THE SOLID LINE, JUNE SCORES

relative lengths of this pupil's September and June curves when straightened out. The June curve is about three fourths as long as the September curve.

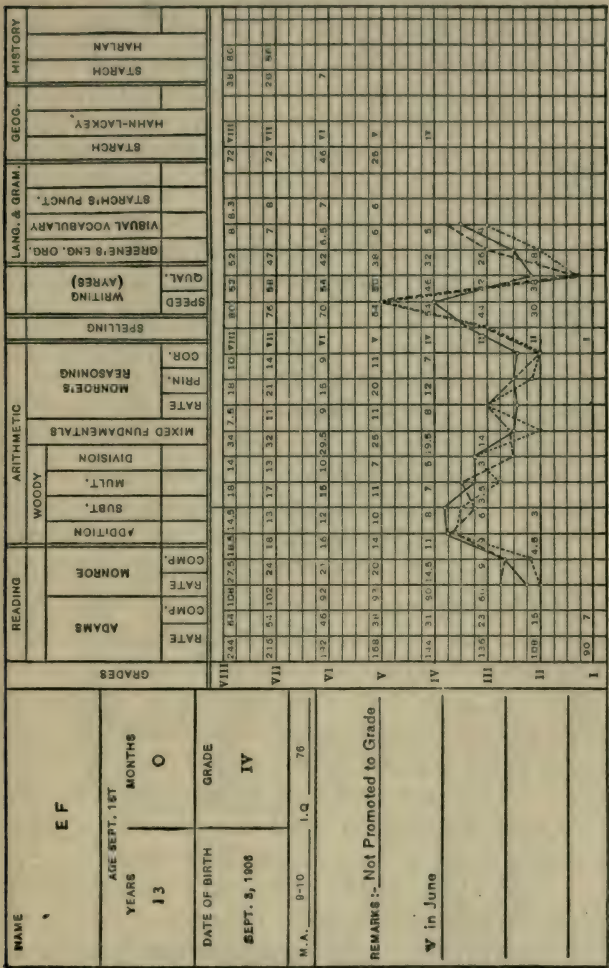

FIG. 10. RECORD OF A VERY DULL BOY. THE DOTTED LINE REPRESENTS SEPTEMBER SCORES; THE DASHED LINE, FEBRUARY SCORES; AND THE SOLID LINE, JUNE SCORES

The Record of a Dull Child

Figure 10 gives the record of a very dull boy with a chronological age of thirteen years, a mental age of nine years ten months, and an I.Q. of 76. Note the great irregularity of the September curve and the general lack of progress throughout the year. Note that in many instances the scores of later tests fall below those of previous ones, and that the reading scores are much lower than the vocabulary scores indicating that poor reading may be due to lack of native ability and not to lack of word knowledge. This boy fell so far short of reaching fourth-grade standards in the June tests that he was not promoted to the fifth grade. He was already two years retarded. Question: Did we do right in retarding this child another year? Problem: What to do with cases of this kind in rural schools where special classes are out of the question, where manual trade schools are beyond the reach of the pupils, when promotion means placing the pupil wholly out of his depth, and when retardation means discouragement. This boy will probably never get beyond the fourth or fifth grade except through mistaken charity. Would it not be well to have some provision whereby such hopelessly retarded children could be permitted to leave school and engage in some useful and profitable work under the guidance of parents or other responsible persons, at least until society becomes sufficiently civilized to make provision at public expense for the proper training of such individuals? They would at least be saved from forming habits of failure and idleness which so many such children acquire during years of forced attendance at school after they have reached the limits of their mental capacities in acquiring knowledge from books. Figure 12 (*c*) shows the relative lengths of this pupil's September and June curves.

It should be remembered that all three of the pupils whose records we have been discussing were taught by the same teacher and no doubt in much the same way.

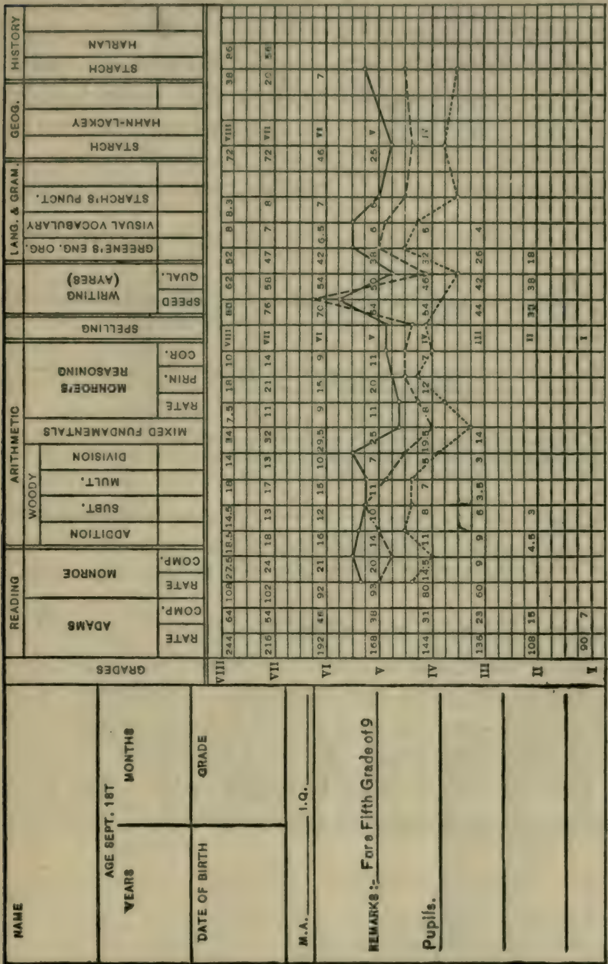

FIG. 11. RECORD FOR A FIFTH GRADE CONSISTING OF NINE PUPILS. THE DOTTED LINE REPRESENTS SEPTEMBER SCORES; THE DASHED LINE, FEBRUARY SCORES; AND THE SOLID LINE, JUNE SCORES

The Record of a Class

Figure 11 is the record of a fifth grade containing nine pupils. It shows that the entire grade has made normal progress or better in nearly every test. As usual, however, the class is weak in quality of handwriting. It is also slightly below grade in arithmetical reasoning, in mixed fundamentals, in spelling, and in geography. On

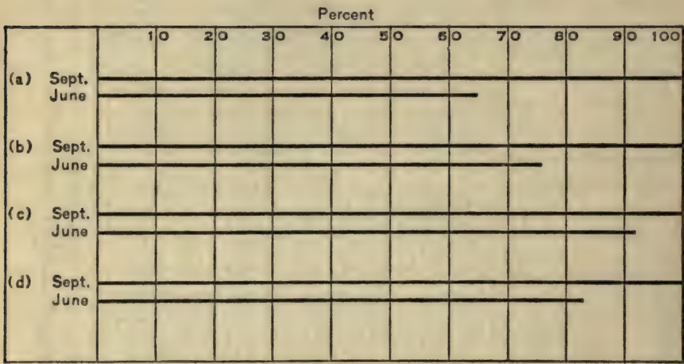

Fig. 12. A Comparison of the Lengths of September and June Curves as Shown in Figures 8 to 11

the other hand, the class is considerably above standard in reading, in the fundamentals of arithmetic, in speed of writing, and in language and grammar. On the whole it shows that both teachers and pupils have done excellent work throughout the year. Relative lengths of September and June curves are shown in Figure 12 (*d*). The June curve is about twenty per cent shorter than the September curve.

CHAPTER VII

MEASURING THE EFFICIENCY OF TEACHERS BY STANDARDIZED TESTS

In chapter VI I told how we used standardized tests and scales to measure the progress of pupils and to tell when they were ready for promotion. In this chapter I shall show how, at the same time, we were measuring the ability of the teachers to get results.

Factors in Teaching Ability

Besides knowledge of subject-matter, one may recognize five main factors in a teacher's efficiency: (1) managing ability; (2) natural aptitude for the work; (3) method and technique of teaching; (4) interest and industry in her work; and (5) that vague thing, personality, somewhat indefinable, but generally admitted to include character, temperament, personal appearance, manners, tact, etc. A teacher must demonstrate ability to organize and manage a school in an orderly manner before any of her other abilities can do their work. With all the other factors present, a teacher's success can be but mediocre if she lacks greatly in natural ability as applied to teaching. She may have all the other virtues, but if she lacks enthusiasm and industry she cannot inspire her pupils; and without an efficient method her other qualities will be ineffective. Finally, her personal qualities, ideals, and conduct must be worthy of emulation if she expects to influence properly the social and moral life of her pupils.

Measuring Teaching Efficiency by Results

Now no one of these factors can be accurately and objectively measured independently of all the others; but they

all function coöperatively in getting results — results which are manifested in the development of knowledge, skill, and ideals among pupils. And many of these results can be measured by means of standardized tests.

Is it not customary to measure the efficiency of the workman, professional or otherwise, by the amount and quality of the work he turns out? The efficiency of the wood-chopper is gauged by the number of cords of wood he can chop in a definite length of time; of a bricklayer, by the number of bricks he can lay in a day; of a farmer, by the per-acre yield and profit of his crops; of the lawyer, by the per cent of cases he wins for his clients; of the doctor, by the proportion of cases he cures; and so on, for almost any line of human endeavor we could mention. Experience has set certain standards of achievement in every kind of work and the efficiency of the worker is judged by the ratio of his product to these standards. If he does only three fourths as much as the standard, he is only seventy-five per cent efficient.

Then why should not the efficiency of teachers be measured by the amount of work they turn out? Too long has efficiency been taken for granted or, at best, left to the judgment of supervisors making guesses based on classroom observation, more or less perfunctory, of teachers' good looks, engaging personalities, show of energy and enthusiasm, evidence of preparation, handling of supervisor's pet methods, etc. Although such observation is not without value in helping to secure a fair estimate of a teacher's ability, it does not alone furnish a safe and sane basis for judgment; and any teacher so judged to be inefficient has a right to complain of unfairness of treatment. Judgments based on mere classroom observation are not fair either to the teachers or the taxpayers. The reasons why this is so have already been summarized, but they will bear repeating here.

(1) Such observations do not furnish a sound basis for judgment; (2) the superintendent's opinions are quite apt to be colored by personal prejudices toward an individual teacher or her methods; (3) classes often show at their worst in the presence of visitors; (4) even the teacher may fail to do herself justice under the critical eye of the superintendent; and (5) classroom observation takes no account of the actual results the teacher may be getting. Furthermore, such observation is not only unfair, but inaccurate. It is inaccurate because of all the reasons just given, and because (*a*) some teachers do excellent work when the superintendent is present and shirk all the rest of the time, and because (*b*) if such teachers do their own testing, even the results may be made falsely to appear satisfactory.

If the education of a child consists in his acquiring certain knowledge, skills, habits, and ideals that will make him a useful and desirable member of the society in which he lives, and if teaching is the proper leading and directing of the child in utilizing his natural abilities to acquire these things with the least possible expenditure of time and energy, then why is it not eminently fair to all concerned to gauge the teacher's efficiency by measuring at definite intervals the progress her pupils are making in the acquisition of the prescribed knowledge, skills, habits, and ideals, provided we have well-defined standards of achievement for each grade such as the standardized tests furnish?

Anyway, I put the question squarely up to the teachers of my district at one of the teachers' meetings held early in the year. They were asked to decide whether they would prefer to have the superintendent estimate their efficiency on the basis of what classroom observation he could make in schools so widely scattered, or according to the progress made by their pupils as measured by standardized tests.

Objections of Teachers to Rating by Results

As I had expected, the question evoked a lively discussion and some well-founded objections were raised. Most of the teachers were ready to admit the inaccuracy and unfairness of ordinary methods of rating teachers, but insisted that there was a large probability of the same weaknesses in the plan I proposed. Their chief objections were: (1) that knowing they would be judged by the results of the tests, some teachers would be tempted to cheat in giving the tests, thereby perhaps gaining a higher rating than would better and more conscientious teachers who gave the tests honestly; (2) that since there are in most schools a sprinkling of mentally deficient or even feeble-minded children who under the most efficient teacher cannot be expected to make normal progress, the records of such pupils, when averaged with those of normal children, would seriously and unjustly lower the rating of the teachers; and (3) that of two teachers of equal ability one might have a school whose pupils averaged so much higher in intelligence than those of the other that she would undeservedly obtain a much higher rating. The majority thought that, if these principal objections could be satisfactorily disposed of, the plan would be worth trying. The few teachers who displayed marked lack of interest in the subject had already on other grounds shown themselves to be of the time-serving variety. I therefore ignored their attitude. But I wanted the intelligent acquiescence of the better teachers in some sort of a reliable teacher-rating scheme.

The Objections Answered

The first two objections I had foreseen and prepared for. As to the first, I explained that most of the tests were

furnished in two or three different forms, so that the same forms would not have to be given twice in the same year. This would obviate the possibility of any teacher drilling pupils on the exact contents of a test, drill along the general lines of work suggested by the tests being not only legitimate but desirable. Furthermore, I pointed out that my plan of checking the work of the teachers in giving the tests would ensure the immediate discovery of any serious attempt at cheating on the part of dishonestly inclined teachers — such as allowing more than the allotted time for each test or giving illegitimate aid to the pupils during the tests. This plan was for me to repeat in each school one or two of the tests *after* the teachers had given them all. Then if there was any great discrepancy between the results of the tests I had given and those a teacher had given, such discrepancy would indicate either dishonesty or gross carelessness in giving the tests.

The second objection offered a good opportunity for a discussion of intelligence tests and their uses. I passed around some samples of the Otis Group Intelligence Test and explained how, by the use of such tests, we could locate the pupils who were mentally incapable of making normal progress. The progress records of these pupils could be thrown out in calculating the teachers' ratings, and we might use only the records of pupils who graded eighty per cent of normal or better by the intelligence tests.

The third objection was one which had not before occurred to me. I suggested that we leave the matter until our next meeting by which time I hoped to have a satisfactory solution.

The Plan of Rating Teachers

The plan I finally worked out and which was accepted as satisfactory by the teachers follows: From the results

of the June tests the average scores by grades for each test were to be calculated for each school. Each of these average grade scores was to be divided by the corresponding standard score, thus giving the per cent which each grade score was of normal.

Table VII illustrates the method by which these per cents for each grade were obtained. The figures opposite the pupils' numbers are the rate and comprehension scores in reading for a fifth grade in the June tests.

All grade per cents similarly derived for each school were to be averaged to give the teacher's percentage mark. Then, to offset the differences in intelligence between schools, if the average of the I.Q.'s in a school was less than 100, the difference between it and 100 was to be added to the teacher's mark, and if the average of the I.Q.'s was more than 100, the difference was to be subtracted from the teacher's mark. This procedure served in the one case to discount the part of a school's progress that was due to superior native intelligence and in the other case to give the teacher an allowance to offset her school's mental disabilities. This plan disposed of the third objection mentioned above. Its accuracy, of course, depends in large part on the degree of correlation between the scores in intelligence tests and the scores in achievement tests. That the correlation is high will be shown in a subsequent chapter. This scheme does away with the necessity of discarding the scores of subnormal children in calculating the ratings of teachers, although such discarding would save considerable work without materially affecting results.

First Illustration of the Plan

Below are given concrete illustrations of how the ratings of several teachers were obtained at the end of the year.

The first two are both very competent and successful teachers. In A's school the average of the I.Q.'s of all the pupils was 88. This school had thirty-two pupils, four of whom graded as feeble-minded. Twenty of them had I.Q.'s of less than 90. Only five had I.Q.'s over 100, and

TABLE VII. JUNE SCORES OF A FIFTH GRADE IN READING

Pupil number	*Rate*	*Comprehension*
1	108	26
2	98	20
3	73	14
4	85	19
5	101	25
6	95	21
7	50	8
8	105	20
Average	89.4	19.1
Standard	93	20
Per cent average score is of standard	96.1	95.5

the highest was 122. In B's school, consisting of thirty pupils, the average of the I.Q.'s was 111. The intelligence level in this school was unusually high, just as in the other it was unusually low. There were no feeble-minded children, and only one pupil graded as very dull. Eighty-three per cent of the pupils were normal or above. Three had I.Q.'s above 140.[1]

Table VIII gives the grade per cents (computed as shown in Table VII) on each test in A's school — also the general average for the whole school. The 78, for instance, at the top of the second-grade column in Table VIII means that the second-grade average score in rate of silent reading was 78 per cent of the second-grade standard score.

[1] All intelligence tests were given, corrected, and scored by the superintendent.

TABLE VIII. GRADE PER CENTS ON EACH TEST — TEACHER A

Subjects	*Grades*						
	II	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Silent Reading							
Rate	78	81	86	90	93	99	98
Comprehension	69	77	80	80	78	85	84
Addition	85	87	92	92	94	96	98
Subtraction	93	91	93	92	93	98	98
Multiplication	93	92	97	93	98	98	100
Division	74	79	82	87	92	95	97
Mixed Fundamentals	72	76	77	80	82	91	93
Arithmetical Reasoning		70	73	78	81	88	87
Spelling	82	80	80	77	83	86	87
Writing							
Speed	96	102	101	104	111	107	109
Quality	67	68	67	65	62	62	65
English Organization		92	94	92	88	94	93
Visual Vocabulary		83	84	81	77	86	89
Geography			82	80	85	89	92
History			78	72	82	84	90
Grade averages	80.9	82.9	84.4	84.2	86.6	90.5	92.0

General average, 86.3.

In comprehension of silent reading the second-grade average score was only 69 per cent of the standard score; and so on for each subject and for each grade. There are 98 of these per cents in the table. The general average for the school was obtained by adding all of them and dividing the sum by 98. The general average in this school was 86.3 per cent, which means that the average achievement of the school, as measured by the standardized tests, was 86.3 per cent of normal. Table IX gives the same data for B's school. In this case the general average was 108.4 per cent of normal.

Then, according to the rating plan described above:

A's ratings = General average for A's school + (100 − Av. I.Q.) = 86.3 + (100 − 88) = 98.3. And B's rating = General average for B's school − (Av. I.Q. − 100) = 108.4 − (111 − 100) = 97.4.

TABLE IX. GRADE PER CENTS ON EACH TEST—TEACHER B

Subjects	*Grades*						
	II	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Reading							
Rate	102	105	111	114	117	123	122
Comprehension	93	101	104	104	102	109	108
Addition	107	109	114	114	116	118	120
Subtraction	114	112	114	113	114	119	119
Multiplication	114	113	118	114	119	119	121
Division	96	101	104	109	114	117	119
Mixed Fundamentals	94	98	99	102	104	113	115
Arithmetical Reasoning		92	95	99	104	110	109
Spelling	104	102	102	99	105	109	108
Writing							
Speed	118	124	123	126	123	129	131
Quality	89	90	89	87	84	84	86
English Organization		114	116	114	116	116	113
Visual Vocabulary		106	103	108	108	105	111
Geography			104	102	111	111	114
History			96	95	106	107	109
Grade averages	103.1	105.1	106.1	106.7	109.5	112.6	113.7

General average, 108.4.

These are the ratings of two teachers of undoubted ability, but with schools widely varying in average intelligence and rate of progress. Yet the ratings show the teachers to be of about equal ability.

The difference in achievement in the two schools is due to difference in the average mentality of the pupils. It would be eminently unfair to expect equal results with the two schools, or to rate A as a poorer teacher than B

because performance in A's school was less than that in B's school.

Second Illustration of the Plan

Now let us consider the cases of two teachers of widely different ability, but with schools approximately equal in size and in the average intelligence of pupils. Teacher C is a normal-school graduate with several years' experience, but with apparently little aptitude for or interest in the work — a teacher who tries to teach as she was taught regardless of her professional training. Teacher D is an enthusiastic girl of twenty years who had had one summer term at normal school and one year's experience.

TABLE X. GRADE PER CENTS ON EACH TEST — TEACHER C

Subjects	*Grades*				
	II	*III*	*IV*	*VI*	*VII*
Reading					
Rate	80	84	88	92	95
Comprehension	75	81	80	85	90
Addition	84	85	90	91	94
Subtraction	92	90	89	96	95
Multiplication	90	89	94	90	96
Division	78	85	80	82	88
Mixed Fundamentals	73	74	75	78	84
Arithmetical Reasoning		70	74	79	82
Spelling	78	75	80	81	89
Writing					
Speed	87	92	93	98	101
Quality	67	70	65	65	58
English Organization		90	90	95	95
Visual Vocabulary		85	82	79	76
Geography			83	87	90
History			76	82	80
Grade averages	80.4	82.3	82.6	85.3	87.5

General average, 83.9

Apparently she got more out of her summer session than many do out of the whole course. Moreover, she has the ability to adapt her knowledge to classroom use.

Tables X and XI give for the schools of C and D respectively the same kind of data as Tables VIII and IX did for the schools of A and B.

TABLE XI. GRADE PER CENTS ON EACH TEST — TEACHER D

Subjects	*Grades*				
	II	*IV*	*VI*	*VII*	*VIII*
Reading					
Rate	95	98	103	107	110
Comprehension	86	94	97	97	95
Addition	100	102	107	107	109
Subtraction	107	105	107	106	107
Multiplication	107	106	111	107	112
Division	89	94	97	102	107
Mixed Fundamentals	87	91	92	95	97
Arithmetical Reasoning		85	88	92	97
Spelling	97	95	95	92	98
Writing					
Speed	111	117	116	119	116
Quality	82	83	82	80	77
English Organization		109	107	107	109
Visual Vocabulary		98	99	96	101
Geography		97	95	104	103
History		93	87	99	95
Grade averages	96.1	97.8	98.9	100.7	102.2

General average, 99.3

The average of I.Q.'s for C's school was 98.8 and that for D's school was 102.2. This is a slight advantage for D's school, but not nearly enough to account for the difference in attainment in the two schools. Calculated as before,

C's rating = 83.9 + (100 − 98.8) = 85.1
And D's rating = 99.3 − (102.2 − 100) = 97.1

Here again the relative efficiency of the teachers is reflected in the respective ratings of their schools when full cognizance is taken of the average intelligence of the two schools.

We use averages rather than medians in computing the ratings of teachers because the schools are small with few pupils in a grade. In larger schools with twenty or more pupils to a grade the median scores could be as well used in figuring grade per cents. In such case one should not neglect to use median I.Q.'s as well as median scores. And it might be well to mention here that when the scores of subnormal children are thrown out of the reckoning their I.Q's should be discarded also; otherwise the teacher's rating would be considerably raised.

Although, of course, this rating does not include everything that should be taken into account in estimating a teacher's worth to the school and to the community, it nevertheless covers one of the most important factors to be considered and furnishes a fairly objective test by means of which on occasion a teacher can be convinced of her own inefficiency. Certainly if a teacher fails seriously in this phase of her work, she cannot profitably be kept on the pay-roll for the sake of her personal appearance, good moral influence, managing ability, or any other factor or factors that go to make up a good teacher.

Salary and Rating

In addition to a substantial general raise in salaries throughout the district for the current year, the school boards were persuaded to grant special increases of one or two dollars per week to certain teachers who rated ninety-five per cent or better with ratings calculated as described.

None of the teachers who failed to get such a raise made any complaint of favoritism, nor could they consistently do so, since they had themselves accepted the basis on which their ratings were determined. Furthermore, the teachers are working this year with the understanding that they will receive bonuses at the end of the year of five dollars for every whole unit that they increase their ratings over those of last year, the bonus not to exceed fifty dollars. Thus, if a teacher's rating last June was 89.2 and next June it has increased to 94.4, she will have increased her rating five whole units. Hence she will receive a bonus of twenty-five dollars. I know that most of the teachers are working hard for a bonus.

CHAPTER VIII

COMPARING THE EFFICIENCY OF SPECIAL TEACHING METHODS BY MEANS OF STANDARDIZED TESTS

In the last chapter five principal factors in a teacher's efficiency were distinguished — namely, (1) managing ability, (2) natural aptitude, (3) method of teaching, (4) interest and industry, and (5) personality. The position was taken that no one of these five factors can be accurately and objectively measured independently of any or all of the other factors.

Although *method* was one of the factors mentioned, we nevertheless now propose to measure the efficiency of methods. Note, however, that we do not propose to do so independently of the other factors.

The Teacher and the Method

In general the efficiency of a teacher and the efficiency of her methods are pretty much inseparable. It is a mooted question whether or not there can be a good teacher without good teaching methods. We hear it argued, for example, that a good teacher with a poor method will accomplish more than a poor teacher with a good method. This argument implies that good teachers using poor methods may secure better results than poor teachers using good methods, in the same way that a good carpenter with few and poor tools can do a better job than can the novice with the best and most complete set of tools obtainable. We must admit that there is much truth in the argument. Sometimes we find that a teacher who is ignorant of approved methods, but who has great natural

ability, is obtaining better results than another teacher who is without natural aptitude, but who, perhaps with all the advantages of professional training, is using, or rather misusing, the most approved modern methods. One has the true teaching instinct and ability to apply general principles and the other lacks these advantages.

Whatever may be the actual relations between good and poor teachers and good and poor methods, we can all agree, I think, that the best teachers are those who combine natural aptitude with thorough knowledge of up-to-date methods together with skill in applying them so as to realize their possibilities. And although we cannot measure the efficiency of a teacher's methods entirely apart from consideration of her general ability, there is a way, nevertheless, by which we can, with the help of standardized tests, obtain fairly accurate comparisons of the efficiency of various special methods, taking at the same time full cognizance of the teacher's general ability.

Eliminating the Variables

This can be done somewhat as we solve simultaneous equations in algebra — that is, by manipulating the various quantities so as to eliminate all but one of the unknowns. The value of the remaining unknown is readily found after the others are equalized so as to cancel each other. Yet it cannot be said that the eliminated quantities are ignored. The manipulations required to bring about the conditions suitable for their elimination give them their full force in evaluating the result.

And so, if we are to find the relative values of two or more special teaching methods, we must equalize as far as possible the conditions under which those methods are tried out, thus eliminating all the unknown quantities but one. The chief of these external conditions that would

affect the accuracy of our results are the general ability of the teachers, the average mental abilities of the several groups of pupils, and the time devoted to class work with the method.

Two Ways of Comparing Methods; the First Case Illustrated

Now there are two ways in which we may want to compare methods. We may want to discover which of two or more special methods of teaching a subject will give the best results when used by teachers of equal general ability, or we may want to learn which of two or more special methods can be used to best advantage by a certain teacher.

To illustrate the first case, suppose we wanted to compare the results of drill in the fundamental operations of arithmetic as conducted in the usual more or less unorganized manner and without much regard for the special difficulties involved in definite types of examples, with results of drill in the same operations by means of the Courtis Standard Practice Tests. To do this we should first choose our teachers for the trial. Their general ability should be as nearly equal as possible in order to eliminate so far as may be any inaccuracy in our conclusions due to differences in ability. Two teachers with approximately equal ratings by the method described in the last chapter would serve admirably. One should have had no experience with, and if possible no knowledge of, the Courtis Practice Tests or of similar practice material, while the other should have had experience in their use and knowledge of their basic principles. It would not do to have the same teacher try to handle both methods because, on the one hand, if she had had experience with the practice tests, the defects of the haphazard procedure would be largely nullified by her knowledge of the prin-

ciples underlying them; while, on the other hand, if she did not have such knowledge and experience, the advantages of the Courtis method would in some measure be lost.

The next step is to choose two groups of pupils. These groups should be neither too large nor too small; neither large enough to be cumbersome to handle as a class nor small enough to make average scores meaningless. From ten or twelve to twenty in a group is probably about right. The pupils in both groups should be in the same grade and the average mental ages and average intelligence quotients of the two groups should be as nearly equal as possible. The pupil's mental ages and intelligence quotients are obtained, of course, by means of intelligence tests, some uses of which will be discussed in the next chapter.

As soon as the pupils have been selected, they should be carefully tested by means of standardized tests in the fundamentals, and their scores should be recorded. The testing of both groups and the scoring of the papers should be done by the same person, preferably a person experienced in such work. The period of drill should begin as soon as the tests have been given. Care should be taken to see that, in each group, exactly the same amount of time is devoted to drill in the fundamental operations each day. At the end of eight or ten weeks the tests should be given again, the scores recorded, and the progress of the two groups compared. The difference in progress of the two groups will approximate the difference in efficiency of the two methods.

The degree of accuracy of the results will depend upon the care with which the tests are given and the degree to which the conditions of the drill work are equalized. It is an open question whether or not the teachers themselves should be informed of the main purpose in view — that is,

the purpose of comparing the efficiency of the two methods. If we could be perfectly sure that both teachers would be thoroughly interested and honest about the experiment, it would undoubtedly be wise to seek their intelligent coöperation, since by so doing we should be more likely to get the best possible results from both methods. But if, thinking that their reputations are at stake, one or both are likely to be tempted to stretch the time limit for daily drill or to persuade the pupils to drill themselves for speed and accuracy outside of class, then it will probably be better to leave them in blissful ignorance of the main plot, merely seeing to it that each teacher devotes the same amount of time to class drill in the fundamentals each day. In this way one can infer what each of the methods would accomplish under everyday working conditions in the hands of equally competent teachers. If one is particularly desirous of getting the best results of which either method is capable, this purpose may perhaps be accomplished by asking each teacher separately to do her very best.

An Experiment in Comparing Methods

This particular problem was worked out in my district last year with rather interesting and fairly conclusive results. The Courtis Standard Practice Tests were not in use at that time in the district, but, wishing to introduce them the following September, I planned ahead to have the stage set for their appearance. That is, before the practice tests were introduced generally, I wanted if possible to prove definitely that better results could be accomplished by their use with less drudgery for both teachers and pupils.

This was before the teachers' ratings had been computed as described in chapter VII. I did not therefore have this

sort of guidance in selecting the teachers to carry out the experiment; but I did have the records of progress for each school as shown by the September and February tests.

Wishing to secure as representative results as possible under the circumstances, I tried the experiment in each of three different towns. To handle the work with the practice tests one teacher in each town was selected who had shown interest and capability in adapting new ideas to classroom use and whose schools had made normal progress during the first half of the year. Five weeks before the end of the winter term these three teachers were furnished with the Courtis Standard Practice Tests, Teachers' Manuals, and Students' Practice Pads. I showed them how to use the tests, pointed out their advantages, and explained the principles underlying them. Then I told them that for special reasons of which they would be informed in due time, I was anxious to have them become as expert as possible in using the tests by the end of the term. They assured me that they would do their best and I believe they did. At any rate, they did exceedingly well.

The other three teachers, one in each of the same towns, were chosen because their schools had also shown about normal progress for the first half of the year, and because of the further fact that they were all teachers of many years' experience, somewhat set in their ways and not taking kindly to new ideas, but withal hard-working, trustworthy, and capable of doing very good work in their own ways. In other words, they were good old-fashioned teachers.

The intelligence tests had been given by this time throughout the district, and I hastened to record all the mental ages and intelligence quotients for use in selecting the several groups of pupils. They were finally chosen

according to the plan outlined above except that the grades in any one school were too small to permit groups of ten pupils to be selected from the same grade in such a way that the six groups would all average the same in both mental ages and intelligence quotients. However, the conditions regarding mental ages and intelligence quotients were strictly observed and allowed for. The lowest mental age in any group was ten years nine months and the highest was eleven years five months. The I.Q's ranged from 97 to 105.

Using the Woody Scales for measuring the ability of pupils in the fundamental operations, I gave the first tests to the six picked groups during the first week of the spring term, and corrected and scored them myself, tabulating the average scores for each group in each subject as shown in Table XII, in the columns marked *A*. As I gave the tests to each group of pupils, I had a talk with their teacher, telling her that for very important reasons I wanted her to see how much improvement she could bring about in that particular group during the ensuing twelve weeks by drilling the pupils together just fifteen minutes each day for speed and accuracy in the fundamental operations of arithmetic. The three teachers trained for the purpose were directed to use only the Courtis Standard Practice Tests for the drill, but to use them for all they were worth. None of the teachers had any inkling of the real object in view. Yet each one was keyed up to do her best after her own fashion. Every pupil in the six groups was promised a special holiday for not missing more than one day during the term. Pedagogically, of course, this may have been questionable, but practically it proved very effective; and I hoped that the end would justify the means. At any rate, I know that a large majority of the pupils got their holiday.

TABLE XII. AVERAGE SCORES IN THE WOODY SCALES

(*a*) Groups not using Practice Tests

Operation	*Group 1*		*Group 2*		*Group 3*		*Averages*	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
Addition	11.6	14.8	12.0	14.7	11.8	15.1	11.8	14.8
Subtraction	8.2	10.6	8.4	10.3	7.9	10.5	8.2	10.5
Multiplication	8.5	12.2	8.3	12.0	8.1	12.4	8.3	12.2
Division	5.5	8.5	5.9	8.0	6.1	8.8	5.8	8.4
Mixed Fundamentals	21.0	25.9	21.0	26.1	22.2	27.0	21.4	26.3

(*b*) Groups using Practice Tests

Operation	*Group 4*		*Group 5*		*Group 6*		*Averages*	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
Addition	11.9	16.0	11.7	15.8	11.7	16.3	11.8	16.0
Subtraction	8.1	12.4	8.6	12.2	8.0	11.9	8.2	12.2
Multiplication	8.0	15.3	9.0	15.5	8.4	14.8	8.4	15.2
Division	5.4	9.6	5.7	10.2	5.8	9.3	5.6	9.7
Mixed Fundamentals	22.0	29.0	19.5	30.0	23.0	29.6	21.5	29.5

The work was supervised as closely as possible throughout the term. Neither from observation nor by questioning pupils could I detect any evidence that the rules of the game were being disregarded by any of the teachers. At the end of twelve weeks the pupils were again tested by means of the Woody Scales. The average scores for each group were placed in the *B* columns of Table XII in such a way that each group's second score in each subject was opposite its first score in the same subject. According to the table, the average score of the pupils of group 1 on the first test in addition (column *A*) was 11.6. The score for the same group in the second addition test was 14.8 as shown in the first *B* column. The scores for the three

groups which did not use the practice tests are average for both first and second tests and recorded in the fourth *A* and *B* columns, while in like manner the general averages for the three groups which used the practice tests are recorded in the last two columns of the table.

It will be noted that, according to the *A* columns of the general averages, the two main groups, the first consisting of the three smaller groups in which the practice tests were not used, and the second, of the three groups in which they were used, started almost exactly even in the race as might be expected under the circumstances. The first score of both groups in addition was 11.8 and the first score in subtraction for each group was 8.2. The remaining first scores differed by but one or two tenths of a unit. But this correspondence is no longer apparent when the *B* columns of general averages are considered. The final scores of the group using the practice tests are seen to be considerably larger than those of the group not using them. The differences between the scores contained in the fourth and last *B* columns represent the difference in progress of the two main groups.

The group of pupils drilled with the practice tests has all the best of the argument, the difference in progress being sufficiently great to prove conclusively considerable superiority for the Courtis method properly handled. On the whole, the improvement of all the groups was surprisingly large for a period of only twelve weeks. It amounted on the average to about a year of progress for the groups which did not use the practice tests and to about a year and three quarters for the group using the practice tests. This merely goes to show what can be accomplished by intensive work along definite lines when the interests of teachers and pupils have been thoroughly aroused.

The Second Case: Comparing Methods when Used by the Same Teacher

Now to return to the second way in which we might want to compare special methods. Suppose we wish to learn which of two or three special methods will give the best results with a particular teacher. This is quite a different matter from measuring the relative efficiency of the methods themselves. Only in exceptional cases can methods be accurately compared when handled by the same teacher. For such a purpose the teacher must be equally skilled in the use of the methods to be compared and without prejudice in favor of any particular method. In particular she must have a thorough knowledge of the special advantages and disadvantages of each method and know how to minimize the latter and make the most of the former. In no other way could the methods be given a fair trial. Only an exceptionally well-trained and widely experienced teacher, with the impartial mind of a scientist seeking truth through experiment, could fulfill these conditions. Such teachers are not to be found in every school system.

We know that quite often a method of teaching which has proved highly successful, when handled by its originator or by teachers specially trained by him, has failed miserably when introduced into a school system where the teachers were trained and experienced in other methods. And such failure is not to be wondered at. When the mere form of a new method, without its spirit, is introduced among workers lacking a knowledge of the proper technique to accompany the method, and naturally prejudiced in favor of their own methods, the new method is foredoomed to failure. A few of the better teachers, specially endowed with adaptability and initia-

tive, may grasp the essential advantages of the new method, gradually evolve a suitable technique to fit it, and adopt it as their own. But most teachers, finding themselves accomplishing less with the new method than they did with the old, and longing for the familiar routine, will, unless constant supervision prevents, return surreptitiously at least to their former procedure, convinced that there is none better and that attempting new methods is a waste of time and trying to the nerves.

Of course, if the real interest of the teachers can be aroused in the new method by a judicious advertising campaign before it is introduced, and if everybody's patience holds out long enough, and a definite policy of teacher selecting and teacher training is carried on, eventually the new method will come into its own if it really possesses marked advantages. But in too many instances the innovation is discarded as worthless after a few months of half-hearted trial without any adequate attempt to modify the environment to fit the new method. And the chief factors contributing to such failures in attempting to introduce into a school system new methods of teaching are the indifference of teachers or their actual antagonism toward new methods in general, their lack of knowledge concerning particular new methods, and their lack of foresight and initiative in adapting themselves and their ideas to changing conditions. Probably the most annoying factor and the one most difficult to eliminate is the teacher's mental attitude toward new ways of doing things, her clinging to familiar trails, and her aversion to breaking new paths even in the interest of finding a smoother, shorter, and pleasanter road to her goal.

Hence new methods, unless real interest and belief in them has been aroused in the teacher beforehand, have to

contend against ignorance and indifference or prejudice from the start. I repeat, therefore, that the efficiency of new methods cannot be accurately compared with that of old methods if the new ones are tested by the very teacher whose own methods are being questioned as to their comparative worth. Her attitude is too much like that of the hen defending her chickens from the hawk that would destroy them, the teacher's chickens being her own familiar methods while the hawk is the superintendent with his disturbing new ideas.

We can, however, determine pretty accurately which of two methods a teacher can (or will) handle most efficiently regardless of the actual possibilities inherent in the two methods. And since it is essential that each teacher use, in general, the methods with which she can produce the best results, it is also essential that we know what those methods are. It will not be found profitable, merely for the sake of having certain new methods, to enforce their continued use on teachers who cannot or will not produce as good results with them as they produce with their own methods. So we must have some way of determining whether or not teachers are doing as well or better with the new methods after using them a reasonable length of time, say six months or a year.

A Suggested Plan of Procedure

This can be done with the help of standardized tests. First select ten or a dozen pupils in the school with mental ages and intelligence quotients as nearly equal as it is possible to arrange. Divide them into two equal groups that average about the same in mental ability. Next test them with some standardized tests in the subject for which special methods are to be compared. Then have the teacher try out two methods, one on each group of

pupils, over a period of three or four months. At the end of that time give the tests again and compare the progress of the two groups.

Such a trial will not prove necessarily which method is the best as regards possibilities, nor with which method the teacher *could* do the best if she had the proper inclination and training, but it will prove which method she *will* do the best with under existing conditions. And that is the essential point. If, after preparing carefully for the introduction of a new method of teaching some subject, by discussing its possibilities with teachers individually and collectively, and by furnishing them with suitable reading material concerning its basic principles, special advantages, and technique; if after demonstrating to the teachers the proper handling of the method and giving them a reasonable length of time to acquire skill in its use; and if after striving in every way to arouse their interest and hearty coöperation in giving the new method a thorough try-out; if, after doing all these things and as many more as you can think of, you make such a comparison as outlined above and find that a teacher either cannot or will not do at least as good work with the new method as she did with the old, then it is time to discard either the teacher or the method. If your best teachers have succeeded in getting superior results by using the new method, it means that the method is all right and it may be wise to keep the method and get a new teacher. But if your best teachers have failed to get better results with the new method after several months of earnest effort, it will be better to discard the method.

Need of Testing Methods by Results

At any rate, in order that the children may get the most for their time and the taxpayers the most for their money,

it behooves us to make sure that the methods in use in the schools under our direction are the most efficient that can be used under existing circumstances. We can do this either by selecting and training teachers to fit our chosen methods or by selecting methods to fit the available teachers. Most emphatically it is not efficiency to cling to new methods forced upon untrained or improperly trained and often unwilling teachers just because they are up-to-date methods, when those teachers are not doing as good work with them as with their own methods. Unless we can train our teachers successfully in the proper use of the new methods, or obtain teachers already trained in their use, we had better stick to the old a little longer. Standardized tests will help to prove whether or not the new methods are more successful than the old methods in a particular environment. Results are more important than methods.

CHAPTER IX

SOME USES FOR INTELLIGENCE TESTS

Practical Notes for Practical Purposes

Another promising offspring of modern psychological science is the standardized intelligence test. In the hands of practical men intelligence tests are proving themselves to be practical tools for practical purposes. During the war they were used to obtain leaders of men for the army; large industrial concerns are using them to pick young men and women to be trained for executive positions; great universities are using them in lieu of entrance examinations to select students; social welfare organizations are using them to discover feeble-minded individuals who menace society as potential or actual criminals; live teachers and educational administrators are using them for various purposes. We have heard much of them during the last three or four years. Are we all getting our share of the help they offer us?

I do not propose to enter into a comprehensive discussion of the nature of intelligence tests, the need for them, their reliability, or the uses to which they might be put. All this has been set forth at length and in a clear and readable manner by Lewis M. Terman to whose book, *The Measurement of Intelligence*, published by Houghton Mifflin Company, I refer all readers desirous of a full discussion of intelligence testing in general and of the Binet-Simon Intelligence Scale in particular. My own purpose is merely to describe how we have put intelligence tests to practical uses in our schools.

Intelligence Tests Needed in School: Faulty Judgments of Teachers

I shall, however, refer for a moment to the need for some method of measuring objectively the relative mental abilities of pupils in the schools. This need is not generally felt even among teachers and school men. Some of the teachers whom I convinced with comparatively little difficulty of the need for standardized tests for measuring the progress of pupils in their studies were inclined to scoff at the idea of intelligence tests. Their attitude may be expressed in the words of one teacher of many years' experience who said with a decided air of assurance, "I guess I can tell the bright children from the dull ones without the help of any intelligence tests." Just before giving the intelligence tests in the school of this particular teacher, I asked her to write down for me the name of the brightest pupil in each grade according to her best judgment.

As might be expected, and as events proved, her estimates were right or nearly right in some cases and entirely wrong in others. As an example of being wrong, she selected as the brightest pupil in grade four, a twelve-year-old girl of small stature who led her class in achievement. Now it must be perfectly obvious to any one who considers the matter seriously that it would be a very unusual thing to find a mentally superior child of twelve years in the fourth grade. The teacher, however, had neglected the age factor in making her estimate of this child's mental ability and had rated her as a very bright child simply because she was doing the best work of any pupil in her class. The fact that the child was small for her age and so did not tower above her classmates of nine and ten probably helped out the delusion. If this girl had been

placed in a class of normal twelve-year-olds, she would have been recognized at once as a dull pupil — a fact which the mental tests at once disclosed. She had a mental age of ten years two months and an intelligence quotient of 80.

In reality the brightest child in the fourth grade proved to be a little girl of eight years six months whom the teacher estimated as "just average." This girl had a mental age of ten years and an intelligence quotient of 118. Among pupils of her own age she would have been a shining star. The teacher's errors of judgment were due to the fact that because of their ages the first girl was working a little below capacity and the second a little above capacity. Teachers and others are too prone to estimate a child's mental ability by comparing the amount and quality of his work with those of the other children in his grade regardless of how much he may be advanced or retarded. If the child happens to be in the normal grade for his age, this judgment may be fairly accurate; otherwise it is prone to be inaccurate. Personal judgment in such matters must be replaced as far as possible by objective measurement.

The Fallacy that All Pupils can make Satisfactory Progress

Furthermore, intelligence tests are needed to help refute a common fallacy which is almost unbelievably widespread in the educational world as well as outside it — the fallacy that under proper conditions and with proper instruction every child, barring the obviously feeble-minded, is about equally capable of making satisfactory progress in any study. This idea is echoed in our Declaration of Independence, which offers as a self-evident truth that "All men are created equal." It is reëchoed in the rabid mouth-

ings of I.W.W.'s proclaiming the equality of men. It is the precept and guide of the teacher who wastes her time and the time of the brighter children of a class while she holds them back and tries desperately to help one or two mentally deficient classmates to keep up with the rest.

Only a short time ago the principal of one of the oldest and most famous academies in New England spent nearly an hour assuring me most vehemently that there was absolutely no reason in the world why, with proper instruction and sufficient interested effort, one student could not do just as well as another in Latin, history, algebra, or chemistry — and this in face of the fact that he admitted he had never been able to achieve such ideally uniform results in any of his classes. I gathered from his talk, however, that the failure was not due in any measure to inadequate instruction, but entirely to widely varying degrees of interest, industry, and application on the part of his pupils. He was cock-sure and eloquent. I was so amazed at his attitude and so overwhelmed by a torrent of time-worn, dogmatic, and, to him, unassailable arguments upholding his contention, that I could offer but a feeble reply. I am convinced that he went away with the firm belief that I was some new variety of incurable crank.

Now any one with common sense who will forget proverbs and doubtful platitudes long enough to give his common sense time to function, can readily see that men are not born equal. Perhaps they should be, but they are not. They are not born equal mentally, physically, or financially, nor even with that democratic equality of opportunity of which we hear so much. We have all extremes mentally from the driveling idiot to the genius, physically from the bedridden cripple to the physically

perfect human being, and financially from the pauper to the millionaire. Financial inequality may be more or less overcome, and in many cases so also may physical inequality. But mental inequality, according to the psychologists, seems to be pretty much a fixed condition. They, with their brother scientists in the realm of genetics, seem to have proved to the satisfaction of the majority of their fellows that an individual's mental capacities are determined from the moment of his conception, and that the limitations of his mental development are predetermined by the forces of heredity. This means for us, among other things, that as soon as a school child has reached his limitations, if not before, he will begin to fall behind his classmates who have inherited better mental equipment, and that no amount of extra coaching on our part or effort on his part will enable him to keep up for long unless the rest of the class is held down to his pace. If, therefore, efficiency means partly the elimination of wasted effort, should we not, in the name of efficiency, eliminate the waste of time and energy expended in the hopeless task of trying to fit all children to the same mould?

The Binet-Simon Intelligence Scale

Only for the past few years, in fact, only since the publication of the Binet-Simon Intelligence Scale (in some of its later and better editions), have we really a practical and fairly accurate tool for the measurement of intelligence, one which can be used effectively by interested persons of ordinary intelligence with little experience in psychological testing. This scale, because of the many years of careful investigation and experiment by its originator, the several painstaking revisions, and its careful standardization both as to content and method of procedure, is undoubt-

edly the most accurate intelligence test available. The fact, however, that each individual must be interviewed separately makes it unsuitable for general use in testing large numbers of pupils, as, for example, in making an educational survey. For a few examiners to test thousands of children in a large school system, or for one examiner to test several hundred children in a small school system, with the Binet-Simon Scale would take more time than is usually available for such purposes. This is especially true if the testing must be done by the superintendent or his assistants along with their numerous other duties.

Group Tests of Intelligence

When we entered the war against Germany our military authorities were faced with the problem of selecting and training thousands of new officers to lead the millions of raw recruits furnished by the draft. Time was at a premium. The psychologists offered their assistance, and after a period of trial it was decided to permit them to select the new officer material by giving intelligence tests to the more promising of the drafted and enlisted men. The above-mentioned limitation to the practical use of the Binet-Simon Test was quickly realized and led to the rapid devising and standardizing of group intelligence tests by means of which hundreds of individuals could be tested at one time. These tests were to some extent based on the Binet-Simon Test and to a greater extent on the special mental tests which had hitherto been used in psychological laboratories (directions, analogies, opposites, etc.). The new instruments, however, were adapted in organization and method of procedure to group presentation, definite response, and objective scoring. By the end of the war such tests had reached a high degree of development.

The industrial and social world, awakening to the possibilities of mental measurement, soon adopted the army tests for their own purposes, as they could well do, since they were dealing mainly with adults. But radical changes were required to fit them for use in testing the mental abilities of elementary-school children. Devising suitable group tests for the younger children who cannot read or write much was the most difficult problem. This problem has been partially solved within the last three years by means of picture completion tests. There are now available a number of excellent group tests adapted to school use. In this district we have used the Otis Group Intelligence Test for the upper grades, the Dearborn test for the lower grades, and the Haggerty tests for all the grades.

Our Original Purpose to Locate the Mentally Defective

Although we have derived several worth-while advantages from the use of standardized intelligence tests in the schools, the original purpose in giving them was to discover all the mentally incompetent children in the schools of the district. The scheme for measuring the ability of teachers by the progress of their pupils, as described in a previous chapter (such progress to be measured by standardized achievement tests), demanded some way of knowing which pupils were mentally capable of making somewhere near normal progress and which ones were incapable of doing so. It is manifestly unfair to expect teachers to secure normal progress with feeble-minded or very dull pupils. Accordingly, the work of determining the mental ages and intelligence quotients of all the children in the district was undertaken soon after they had been graded in October.

The Otis Test

At that time, as far as I knew at least, the most suitable standardized group intelligence test on the market was the Otis test.[1] It contains excellent testing material organized and arranged so as to be easily and objectively scored. It is supposed to be used as low as the third grade, but on checking up the results with those from the Binet-Simon scale I found that, although the correlation was fairly high in the seventh and eighth grades, it grew rapidly less in going down the grades until in the third grade it was too small to bespeak much accuracy for the Otis test. This is assuming, of course, that the Binet-Simon scale is the standard in accuracy. Just as a guess, I might venture the opinion that the Otis test makes too great demands on concentration and acquired reading ability to give accurate results below the sixth grade except with the brightest children.

This failure of the Otis test to give accurate results in the lower grades was somewhat discouraging. I had planned to use it with all pupils above the second grade and then gradually, as I could find time, to test out the first two grades with the Binet-Simon scale. It now appeared that I should have to begin with the individual tests in the fifth grade and work down. In the interests of uniformity and accuracy I planned to do all the mental testing myself, and even with group tests this would be a considerable task in a district where the schools were so scattered.

The Haggerty Tests

Nevertheless, I tackled the job and by the end of the fall term had tested more than seventy pupils with the

[1] This was the first of the tests which Dr. Otis brought out.

Binet-Simon scale. During the first month of the winter term other matters kept me busy. Then came the giving of the midyear achievement tests and the attendant work of tabulating results. I had just got around to taking up the mental testing once more, when the Haggerty tests made their appearance. I ordered some to try out. They were first given in the four lower grades to the same children to whom the individual tests had already been given. I was delighted to find a fairly close agreement between the Haggerty and Binet-Simon results even in the first and second grades. Then I began all over again, giving the Haggerty tests right through the district in all the grades. The giving of the tests took about a week and by the end of three weeks they were all corrected and the results recorded. Each pupil's mental age and intelligence quotient were recorded on his or her graph card where they have often proved very enlightening when studied in connection with the pupil's achievement record on the same card.

A Case in which Intelligence Testing Helped

For instance, I have before me as I write the card of a thirteen-year-old boy with an intelligence quotient of 108. Although his mental age at the time of the test was thirteen years eleven months, he was only in the sixth grade, and his achievement record showed that even in that grade he was doing poor work. Now, why should a child of his age and intelligence be doing poor work in the sixth grade? Any one or more of various conditions might account for it, such as poor teaching, poor general health, adenoids, enlarged tonsils, defective sense organs, unfavorable living conditions at home, constant fatigue from outside work, and so on. But if we are to handle such cases with understanding and sympathy, we must know definitely the cause of the trouble.

In this boy's case a combination of untoward circumstances was found. To begin with, he was much overworked outside of school hours, often at tasks beyond his strength. Moreover, his parents were constantly quarreling and snarling at each other, making home life a misery to the sensitive boy. A medical examination showed him to be in good general health, but revealed the fact that he was a little deaf — a fact never before suspected even by his parents. In connection with this fact it is significant that his teacher was accustomed to speak in rather subdued tones, so that he lost a large part of the oral instruction. To sum up, the boy was hard of hearing, sensitive, tired, and discouraged.

Having discovered these conditions, we moved to remedy them as far as possible. Seating the boy where he could watch the teacher's lips at all times when she was talking to the class enabled him to get much instruction which under former conditions would have been lost to him. A tactful show of sympathy and understanding on the teacher's part, and words of encouragement instead of constant nagging for failure to do the class work, brought a new light to his eyes and the sullen look of a misunderstood boy left his face. His whole attitude toward the school and its work changed. A talk with his father, who did not mean to be either unreasonable or unkind, helped to lighten his burden of work at home. A talk with both parents concerning the effects of their constant bickering on their boy's life served to make home life more pleasant. They were really a devoted couple, and their quarreling seemed to be more from habit and because they enjoyed it than because of real ill-feeling. This pupil is undoubtedly a much happier boy, interested in his school work and gradually catching up with the other children of his age and ability in the school. He is no longer considered dull.

Such investigations and readjustments are decidedly worth while. But before they can take place our attention must be attracted to the need for investigation. And here the worth of standardized tests, intelligently used, is again demonstrated. In this boy's case it is interesting to conjecture whether the need for investigation would ever have become apparent, if the results of his mental and achievement tests had not been recorded on the same card and carefully studied together by some one interested in interpreting them for the best good of all concerned.

This was a particularly interesting case, and for this reason it was chosen to illustrate my point. But it is not the only case where comparison of mental-test records with achievement-test records has led to investigations resulting in permanent good. And there is need of investigation whenever a child grades high in mental ability and low in actual achievement of school work. For it is very unusual to find a pupil, physically and mentally normal, in good health, and with good home influences, who is doing unsatisfactory work in school. If such is apparently the case, there is generally something wrong somewhere; and it is usually possible to make a beneficial readjustment.

Another Case — A Menace

Another card represents a type of pupil constituting one of the serious school and social problems. It is the record of a boy of fifteen years six months. His mental age is nine years two months, and his intelligence quotient 59. This boy's graph shows that he cannot do satisfactory work in the third grade, although he has been in that grade for four years. Investigation revealed his immediate ancestry to be of universally low mental and moral caliber. This boy is a menace to the school and the school

is a menace to him. He is a menace to the school because, with all the dawning strength, instincts, passions, and emotions of the primitive male controlled only by the undeveloped mind of a nine-year-old, he is no fit associate for normal boys and girls. The school is a menace to him because, instead of furnishing him with interesting and valuable employment suited to his abilities, it is wasting time that he could more profitably and instructively employ elsewhere and because it is forcing upon him habits of idleness and failure.

Unless special classes are available, the public school is no place for children with intelligence quotients much below 70, especially when they have become two or more years retarded in their school work. No further evidence is needed that they have reached the limit of their mental development along the lines of the ordinary program of studies. Whenever possible they should be transferred to special institutions where they can have special training suited to their needs and capacities; and measures should be taken to prevent them from reproducing their kind. At any rate, the public schools should be rid of them. With the proofs furnished by the results of intelligence tests, backed by the child's record of achievement in his school work, it ought to be possible to get school boards to act in excusing such children from school even if they cannot be otherwise properly taken care of.

Border-Line Cases

Still more of a problem, from all points of view, are the children with intelligence quotients ranging from 65 to 80. More often than otherwise they appear superficially to be entirely normal or even bright. They may do excellent work in the first four grades where habit formation is the chief end to be attained and where drill is the chief feature

of instruction. Sometimes they continue to do fairly well even in the upper grades in schools where much rote memorizing prevails and where memorizing ability is mistakenly considered an index of general intelligence and learning power. But in properly conducted schools such children begin to fall behind their classmates in the fifth and sixth grades and soon become hopelessly retarded. They have reached the limits of their abilities in learning from books or from ordinary schoolroom instruction. They are very much lacking in the powers of initiation, discrimination, and reasoning demanded by the higher types of learning. They are incapable of higher thought processes. Hence they fail in grammar, problem-solving in mathematics, and in the content subjects if the teaching of the latter demands, as it should, more than mere memorization of facts.

Teachers are often unjustly blamed because such children fail in their work. Parents wonder why their children cannot learn under the new teacher as well as they did under the old when it is in no way the fault of the teacher. The children have simply reached their limit of mental development. If a child reaches the limit of his mental development at a mental age of eleven years, he will never be much older than eleven years mentally, though he lives to be a hundred. Children of this sort are too often permitted to become the pacemakers in their classes to the untold harm of the brighter pupils. But in spite of all attempts to keep them along with the other and brighter children of the same age, they finally get completely beyond their depth and fail day after day in their school tasks until they begin to believe they are absolute failures and that success in anything is impossible for them. They grow discouraged, give up trying, and devote themselves to mischief or wait passively for the legal age limit to be

reached so that they can leave school and earn something in return for their time. Meanwhile, failure and idleness have all too often become habits that follow them beyond the schoolroom and lessen their social efficiency. In such cases the school has defeated its own ends.

This type of child, the high-grade moron, is such a problem partly because he is not generally recognized as being mentally deficient. The shortcomings of the feeble-minded are generally evident, and no one expects much from them. The high-grade moron, however, is usually normal in appearance and in ordinary intercourse with other people appears to be normal mentally. It is only when situations arise which demand the functioning of the higher forms of intelligence that he reveals his deficiencies. Even his teacher often fails to understand why he continually fails in his school work. He is characterized as "obstinate" and "lazy" when in reality he is mentally deficient and incapable of doing the work demanded of him. Carefully conducted mental tests will reveal such cases and should lead to more sympathetic and intelligent treatment of them.

When such children become retarded as much as two years, it is little less than criminal to keep them in rural or small-town schools where there are no special classes for their benefit and where there is not sufficient differentiation of courses to permit of their being given amounts and kinds of work suited to their abilities. If possible they should be sent to manual trades schools where they can be taught a trade and at the same time be given as much cultural training as they are capable of acquiring. Otherwise some arrangements should be made whereby they can leave school and go to work under the supervision of their parents or of other responsible persons who will instruct them in the rudiments of some useful line of

work. They might still be under the supervision of the school authorities to the extent of being obliged to spend as many hours per week in useful labor under real instruction as normal children spend in school; such supervision of the school authorities to continue until the legal age limit for compulsory attendance is reached. And why could not school credits be allowed for such work?

Intelligence Tests Used in Rating Teachers

To return, however, to my main purpose in giving the intelligence tests. When I first discussed with the teachers of the district the feasibility of some scheme of rating teachers based principally on the progress made by their pupils, it was objected that the varying mental abilities of the children would make such rating unfair unless the records of the slower pupils were ignored. But who was to be the judge as to which pupils were incapable of making normal progress? It was this situation which led us to make use of the intelligence tests. We agreed to discard in calculating the teachers' ratings the records of all pupils with intelligence quotients below 80. Later a still better scheme was worked out based on the average intelligence quotients of the different schools in such a way as to take full cognizance of the varying mental abilities of pupils.[1] Thus, a teacher with a school composed in general of dull children would not suffer in comparison with a teacher of equal ability with a school largely consisting of bright children. That is, two teachers of about equal ability would get approximately equal ratings regardless of the comparative average mentalities of their respective schools. In this scheme the intelligence test was the impartial judge whose findings were accepted as satisfactory by both teachers and superintendent.

[1] See chapter VII.

Identifying the Bright Pupils

Another valuable service of the intelligence tests was in locating the children of very superior abilities. In one school of twenty-five pupils I discovered five with intelligence quotients around 140 and none with intelligence quotients of less than 80. This school was locally noted as being uniformly fortunate in securing good teachers under whom the pupils advanced very well indeed. Of course it would be a mighty poor teacher who could n't get passable results with such a school. In another school I found, working with other children of about the same chronological age, a little girl of eight years six months with a mental age of twelve years and an intelligence quotient of 142. In the ordinary run of events she would probably have secured no further recognition of her superior abilities than regular promotion and graduation in due time. She is now nine years five months old and leading her class in the fifth grade. She could probably do satisfactory work in the sixth grade.

This type of pupil is not generally recognized as a serious problem. And, in truth, the situation is more serious for the pupil and the public than for the teacher, however unconscious of the fact the pupil and the public may be. As at present organized, the average school is probably doing such children as much harm as it is good, in that it does not furnish them with opportunity and incentive to develop their capacities to the limit. It is from among these children that the leaders of the future are to come, and the public which foots the bills is being cheated when such children are not given opportunity to develop as they should. The present generation is retarded in progress by the provincial narrowness of natively intelligent but mentally blind leaders of the blind whose possibilities for

development were early cramped to deformity in the narrow confines of the traditional elementary and secondary school programs by being forced to travel in a groove in competition with their mentally inferior classmates. Our school system can never attain nearly to its maximum efficiency until programs and courses of study are so differentiated as to fit the kind and quantity of work to the mental capacities of individual pupils. The standardized intelligence test will prove a useful tool in shaping plans toward that end.

Special Opportunities in City Systems

The problems noted above are present to a greater or less extent in practically all school systems; but it is in the cities that, with the help of standardized tests, they may be most easily solved. The city superintendent has, or can arrange to have, special classes or even special schools to take care of the feeble-minded children so as to separate them from the other pupils. Those troubled with sensory defects or other serious physical deficiencies can be placed in special classes or institutions provided for their benefit. Then with two, or preferably three, divisions in each grade, the children can be assigned on the basis of mental ages and intelligence quotients to groups from which fairly uniform work can be expected.

Let us suppose, for instance, that intelligence tests have been given to the fifth grade in a large city school and that the mental ages and intelligence quotients of all the pupils have been recorded on cards together with their respective names. First, the average mental age for the whole grade should be computed and all cards sorted out which are marked with mental ages more than a year above or below the average for the grade. The pupils represented by these cards should be given special attention. Their

achievement records should be studied and, where possible, they should be retested with the Binet-Simon scale if that scale was not used in the first instance. It will probably be found that most of these pupils do not belong in the fifth grade at all, but in the fourth or sixth grade. Next, the remaining cards may be sorted into four piles. Let the first contain the intelligence quotients below 70; the second, those from 70 to 90; the third, those from 90 to 115; and the fourth, those above 115. These groupings are of course rather arbitrary and might be varied somewhat. All pupils with intelligence quotients much below 70 would probably be best placed in special classes or schools. The other three groups might be termed the A, B, and C divisions of grade five; and the children in each group, being of approximately equal mental age and intelligence, should be able to do about the same kind and amount of school work. Since there are no sharp lines of demarcation between groups, some further adjustments should probably be made as experience might dictate.

The courses of study could then be adapted to the various groups. The group of dull pupils might be assigned a minimum of book work and a maximum of manual training. The pupils in the normal group would perhaps divide their time somewhat evenly between these two lines of work. The superior group could probably accomplish as much of the manual work as the normal group and much more of the mental work.

In this way intelligence tests may assist in bringing about that much-needed differentiation in courses of study which will permit each pupil to have work more suited to his particular abilities. Although it is advisable, where possible, to have a double grouping based on the results of intelligence tests — namely, one grouping according to mental ages for classification by grades and the other

grouping based on intelligence quotients for subdivisions of grades — such a double grouping is not usually possible in the smaller schools where all the pupils in a grade must work together. In these cases the grouping must depend more on the mental ages, as will be explained farther on.

Intelligence Tests for Grading Purposes

It was while engaged in recording the mental ages and intelligence quotients of the pupils on their respective graph cards that the possible use of intelligence tests for grading purposes occurred to me. I gradually became conscious of the fact that, although there was wide variation in the chronological ages of the children in any one grade (as they had already been graded by the standardized achievement tests), the mental ages in a grade did not usually appear to vary by more than a few months or a year from the average mental age for the grade. Now if, as may apparently be expected, there is close correlation between the results of intelligence tests and the combined results of achievement tests, that is, between mental ability and accomplishment of school tasks, why cannot intelligence tests be used instead of achievement tests for grading purposes, at a considerable saving of time and energy?

When, therefore, I had finished recording the results of the intelligence tests on the graph card, I proceeded to develop this idea. The chronological and mental ages of all the sixth-grade pupils in the Tamworth schools were tabulated as shown in Table XIII.

The Small Range of Mental Ages in Each Grade

The variation in chronological ages within this sixth grade is from nine years five months for the youngest pupil to fifteen years three months for the oldest — a total range

TABLE XIII. COMPARISON OF MENTAL AND CHRONOLOGICAL AGES OF SIXTH-GRADE PUPILS
TAMWORTH SCHOOLS

Age	*Number of pupils* Chronological	*Mental*
9–0 to 9–5	1	
9–6 to 9–11	1	
10–0 to 10–5	0	
10–6 to 11–11	3	
11–0 to 11–5	2	1
11–6 to 11–11	6	7
12–0 to 12–5	10	14
12–6 to 12–11	5	11
13–0 to 13–5	1	6
13–6 to 13–11	3	
14–0 to 14–5	2	
14–6 to 14–11	2	
15–0 to 15–5	3	
Total	39	39

of five years ten months, or of nearly six years. On the other hand, the variation in mental ages of the same children is from eleven years five months to thirteen years five months — a total range of only two years. Indeed, if the first two pupils and the last pupil are omitted, the range is only one and a half years. These facts would indicate that the grading with the achievement tests had served to bring together children of much the same mentality and that intelligence tests would possibly have served equally well if not better for grading purposes. Similar tabulations were made for the second- and third-grade pupils. The results were not quite so convincing, but were nevertheless significant. The range in mental ages for the third grade was one year nine months and for the second grade two years three months. There was twenty-two per cent of overlapping of mental ages between these two grades. The increasing range of mental ages within a grade as we go down the grades would seem

to support the reasonable and suspected fact that for accuracy of results these tests are less dependable the younger the children tested. The overlapping encountered in the two lower grades led me to make still another tabulation — namely, of the seventh grade — so that I could compare it with the sixth grade on the basis of the overlapping of mental ages. There was an overlap of about fourteen per cent between these two grades. This would indicate that the amount of overlapping also increases from higher to lower grades and probably for the same reason mentioned above for the increase in range of mental ages.

Mental Ages of Pupils in Each Grade

Then I began to wonder how much differently the pupils would have been grouped by grades if the grading had been done with intelligence tests instead of achievement tests. So I constructed a distribution as shown in Table XIV. Having no established data as to what the limits of the range should be for the different grades, considerable experimenting was necessary with different arrangements of intervals. A two-year range was finally adopted, since I had already found, as described above, that the range of mental ages for each grade was about two years. Since children ordinarily enter school between ages six and eight, and since the chronological age of a normal child corresponds with his mental age, the first grade was assigned the range of mental ages from 6–0 to 7–11. (The expression "7–11" means 7 years 11 months and so for like expressions.) The interval used in Table XIV is one year, but two intervals are allowed for each grade in order to show a more exact distribution. This arrangement also allows for an overlapping between grades of one year of mental age. Thus, the normal range for the first-grade pupils is from 6–0 to 7–11, that for the second grade from

7–0 to 8–11, that for the third grade from 8–0 to 9–11, and so on. Moreover, the children in any annual age group may be normally in either of two grades. For instance the nine-year-olds are normally placed in either the third or fourth grade. The first grade might be regarded as having a range of three years because all children with mental ages below 6–0 will naturally be included in that grade. A somewhat similar statement may be made for the eighth grade, since it might be expected to include any children with mental ages above 13–0. This bunching of mental ages is, of course, due to the fact that these grades are the lowest and highest respectively in the school.

TABLE XIV. MENTAL AGES OF PUPILS IN EACH GRADE

Mental ages	*Grades*								*Total*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	
5 to 5–11.....	8								8
6 to 6–11.....	39	4							43
7 to 7–11.....	45	43	4	1					93
8 to 8–11.....	2	46	28	5					81
9 to 9–11.....		5	41	26	4	1			77
10 to 10–11.....			3	19	27	6	1		56
11 to 11–11.....			2	4	36	23	5		70
12 to 12–11.....				1	4	47	18	3	73
13 to 13–11.....					2	3	28	3	36
14 and over.....						6	15	34	55
Total........	94	98	78	56	73	86	67	40	592

Grading by Mental and Achievement Tests Substantially the Same

Table XIV shows the distribution of pupils as they are actually graded in this district on the basis of achievement in standardized tests. Five hundred and ninety-two children are represented. All figures between the heavy zigzag lines represent children normally placed according to their mental ages. The figures outside these lines represent pupils working, for some reason, in higher or lower grades than the tests show them to be fitted for. Take the third-grade column, for instance. In this grade there are 28 children between 8–0 and 8–11 and 41 between 9–0 and 9–11 that rightly belong there. There are four children in the grade that, according to their mental ages, ought to be in the first or second grade, and on the same basis still other children belong in the fourth and fifth grades.

Now, if all the schools were graded strictly on the basis of the mental ages of pupils, *all* the figures would fall between the zigzag lines. Hence 89 out of 592, or 15 per cent, of the pupils are working above or below their indicated mental capacities. Of these, 7.1 per cent are working above or trying to, and 7.9 per cent are working below. This shows on the whole a pretty close agreement between the results of intelligence and achievement tests and indicates that either gives substantially the same basis for grading.

I have studied the records of the children whose mental ages show them to be misplaced and find that most of those working above normal grade are pupils who had been pushed too far ahead by their teachers before the preliminary grading took place and whom, since they were working hard to hold their places, we did not demote when regrading. About half of the pupils shown as working

below their apparent mental capacities are accounted for by retardation due to sickness or absence, poor general health, sensory defects, etc. Most of the others remain a mystery as yet. Gradually we hope to work most of the misplaced ones into their proper mental-age groups so that the grouping of pupils throughout the district will be based pretty closely on mental age.

City schools can be graded with intelligence tests into eight mental-age groups as shown in Table XIV and then, since there will be a wide variation of intelligence quotients within each mental-age group, these groups can be subdivided into grade divisions or sections as explained above. But the smaller rural schools without grade subdivisions must necessarily be satisfied with a less perfect distribution.

A Proposed Plan of Grading in a Rural School

Let us suppose that we have given the intelligence tests in a rural school and that the mental ages and intelligence quotients of the pupils are found to be as shown in Table XV. Now, let us select from this table all the pupils with mental ages within the first-grade range (all below 8–0); and let us list them separately in Table XVI with their respective intelligence quotients.

In discussing Table XIV it was noted that part of the children in the 7–0 to 7–11 age group would normally be in the second grade. How shall we decide which ones to place in the second grade? To begin with, no child just beginning school will belong there. Accordingly, in Table XVI let us mark with a star the number of each pupil who attended school the previous year. These pupils may enter the second grade if their mentality is normal or better. Let us therefore mark with an additional star those with intelligence quotients of 90 or above. Those thus marked with a double star may be assigned to the second grade.

TABLE XV. RESULTS OF MENTAL TESTS IN A SELECTED SCHOOL

Pupil number	*Mental age*	*Intelligence quotient*	*Pupil number*	*Mental age*	*Intelligence quotient*
1	5–0	76	23	7–0	80
2	7–1	76	24	13–0	106
3	7–11	103	25	14–7	110
4	7–9	79	26	9–4	73
5	6–11	100	27	7–9	83
6	8–4	91	28	9–8	80
7	15–7	128	29	7–8	68
8	10–8	100	30	14–0	110
9	15–0	123	31	9–10	78
10	11–10	84	32	9–0	93
11	13–7	108	33	11–0	108
12	10–9	132	34	12–4	80
13	9–2	96	35	9–0	95
14	11–1	100	36	8–0	92
15	13–9	138	37	10–6	85
16	9–7	101	38	10–1	73
17	8–5	71	39	8–6	100
18	10–0	90	40	9–1	85
19	7–9	95	41	12–0	83
20	10–6	70	42	13–9	102
21	13–5	108	43	8–7	73
22	8–6	82			

TABLE XVI. PUPILS WITH MENTAL AGES BELOW EIGHT YEARS

(Data from Table XV)

Pupil number	*Mental age*	*Intelligence quotient*
1	5–0	76
2	7–1	76
3**	7–11	103
4*	7–9	79
5	6–11	100
19**	7–9	95
23	7–0	80
27*	7–9	83
29*	7–8	68

All the others in this table will therefore go to make up the first grade.

Next let us consider the mental-age group from 8–0 to 8–11 and list them in Table XVII. Part of these belong in

TABLE XVII. PUPILS WITH MENTAL AGES BETWEEN EIGHT AND NINE

(*Data from Table XV*)

Pupil number	*Mental age*	*Intelligence quotient*
6*	8–4	91
17	8–5	71
22	8–6	82
36*	8–0	92
39*	8–6	100
43	8–7	73

the third grade and part in the second. We will choose those with intelligence quotients of 90 or better for the third grade and mark each of their numbers with a star. The second grade will then consist of pupils 17, 22, and 43 from Table XVII and pupils 3, and 19 from Table XVI.

Table XVIII lists the pupils of the mental-age group from 9–0 to 9–11. The starred numbers (intelligence quotients of 90 or above) will be placed in the fourth grade, while the rest, together with the starred numbers from Table XVII, will make up the third grade.

TABLE XVIII. PUPILS WITH MENTAL AGES BETWEEN NINE AND TEN

(*Data from Table XV*)

Pupil number	*Mental age*	*Intelligence quotient*
13*	9–2	96
16*	9–7	101
26	9–4	73
28	9–8	80
31	9–10	78
32*	9–0	93
35*	9–0	95
40	9–1	85

Table XIX lists the age group from 10–0 to 10–11. From this table pupils 8, 12, and 18 will be placed in grade five, while pupils 20, 37, and 38 will go with pupils 13, 16, 32, and 35 from Table XVIII to make up the fourth grade.

TABLE XIX. PUPILS WITH MENTAL ACES BETWEEN TEN AND ELEVEN

(*Data from Table XV*)

Pupil number	*Mental age*	*Intelligence quotient*
8*	10–8	100
12*	10–9	132
18*	10–0	90
20	10–6	70
37	10–6	85
38	10–1	73

There may be some question as to the advisability of placing pupil 18 in the fifth grade, since his intelligence quotient is barely 90. On the other hand, if pupil 12 has had good instruction and is ambitious and industrious, he may be able to work in grade six, since his intelligence quotient of 132 shows him to be a pupil of very superior ability. The remaining children listed in Table XV may be assigned to their grades in like manner, whereupon the preliminary grading of the school is completed. Some readjusting will probably be found necessary for various reasons which the results of intelligence tests do not allow for. But when once adjusted there should be possible a uniformity of achievement within grades that is absolutely impossible in the school as ordinarily graded, where pupils differing in mental age by as much as five or six years are often found working together, or trying to work together in the same grade.

As I have said before, when I first attempted to grade pupils there were available no standardized group intelligence tests that would cover all the grades. I therefore

used achievement tests for grading purposes, as explained in chapter IV. Although that grading has proved satisfactory, and although Table XIV plainly shows it agrees closely with the grading that would have been made if intelligence tests had been used, nevertheless, if I had any more preliminary grading to do, I should do it with the group intelligence tests supplemented by the Binet-Simon individual test wherever there was any doubt of the accuracy of the results of the group tests.

CHAPTER X

REACTION OF TEACHERS AND PUPILS TO STANDARDIZED TESTS

After having set forth my own views as to the value of standardized tests in improving the efficiency of the schools, and after having described in considerable detail my methods of using the tests for such a purpose, it occurred to me that it would be only fair to give the teachers and pupils a chance to tell their side of the story; to tell in what ways, if any, standardized tests had been of benefit to them. If the work carried on with the tests for two years had been as successful as I had judged it to be from my point of view, the reports from the majority of the teachers and pupils should be favorable and would thus afford considerable support to my own views as published. If their reports were not favorable, then many of the values I had claimed for the tests would have to be discounted and some of them would have to be declared entirely imaginary.

Accordingly, all the teachers were invited to submit a short paper on the advantages of using standardized tests, this paper to be based wholly on their own two years' experience in using the tests in their schools. Nineteen teachers responded. The papers were well shuffled before any of them had been read, and every other one beginning with the first was then chosen for reproduction here. Afterward those not chosen were read, and all were found to be in the same vein except three which were unfavorable. It was mere chance that none of the unfavorable ones were drawn for reproduction.

One of the papers which expressed unfavorable opinions of standardized tests was from a very excellent teacher of many years' experience and very thorough training in the normal schools of twenty-five years ago. In fact she had taught several years in teacher-training schools as a young woman. The fact that she had fallen from high estate to the level of a small rural school speaks for itself. She had got into a rut which was too comfortable to leave for new pathways. Worse still, her mind, during the last stages of its plasticity, had apparently been caught in that violent agitation of ten or a dozen years ago which declared any sort of test or examination to be a cruel abomination, highly detrimental to the physical, mental, and moral health of its victims. That agitation was, of course, a reaction against the foolish, unreasonable, and unjust so-called examinations in vogue in city schools at that time. This particular teacher's mind seems to have crystallized at that point, and she now has absolutely no use for any kind of a test. She had heard of standardized tests and that was about all. She would not discuss their purpose or advantages nor try to see any good in them. She gave them carefully and painstakingly as required, but without interest and under protest, so that neither she nor her school derived much benefit from them.

Another of the unfavorable responses was from a local crank with no special training and little education. She had "kept school" for many years and had acquired a local reputation as a "smart" teacher mostly on account of her disciplinary ability which was of the lowest order. She had few of the qualifications of a successful teacher and almost no conception of a teacher's most important duties and responsibilities. No newfangled notions for her.

The third was from a young teacher, daughter of a school board member, who had little interest in anything

but her salary and a good time. Standardized tests took up too much of her "spare time." I cannot consider any one of these papers as reflecting seriously upon the value of standardized tests.

The following are the eight papers chosen for reproduction:

What the Teachers Think of the Tests

My appreciation of having had the privilege of introducing standardized tests in my school cannot be too strongly emphasized. Before I began using these tests under the guidance of Superintendent Brooks, I had always depended upon my own selection of twenty or thirty questions (examinations so called, and dreaded by the pupils) to be thought out and prepared before school opened in September, then again in June. How much better to have these tests scientifically prepared for us!

No school can accurately determine the progress of its pupils, either as a group or individually, without using these tests.

One of the greatest advantages, after obtaining the results of the tests on the graph cards, is that they show just wherein the teacher or the individual pupil has succeeded or failed. Nearly every pupil is interested in studying his graph card to discover his weak points and is desirous of exhibiting and explaining the card to his parents. With the help of such concrete evidence as these cards furnish one can face an irate parent with much greater assurance when he or she demands to know why James was not promoted.

One essential of classroom instruction is to have some scientific method of measuring the progress of pupils and classes. Up to quite recently we have been unable to compare accurately teacher with teacher, school with school, and pupil with pupil. The standardized tests furnish us with standards by means of which such comparisons can be fairly and accurately made.

E. M. W.

I now consider standardized tests the only fair means of measuring a pupil's ability and progress in his studies. For several years I had been reading about the tests and of course realized, after five years of trying to grade rural schools according to my own standard of efficiency or those of the superintendent, that we needed something of the sort; but I did not believe that a method had been found that would truly work until I used standardized tests this year in the Chocorua school under Superintendent Brooks.

I was eager to give the first tests out of curiosity and I watched with much interest the attitude of the children towards them. They were alert, quiet, and determined. The fact that they were being measured by a fair standard in comparison with thousands of other boys and girls made them feel the "exams" were going to be really important and worth while. They knew that whatever work they did would be appreciated at its true value and corrected fairly, and that the results would be an accurate index of their achievement.

When I corrected the tests I became enthusiastic. The saving of time and energy from the old method of examinations, and, above all, the fact that they showed up in every study the weak points of each pupil was truly remarkable. I became so interested that I read Monroe's *Measuring the Results of Teaching* and *Educational Tests and Measurements* through again, understandingly at last, and even sent to the State Library for further information.

After copying the graph cards I knew exactly where to begin with each pupil to make up his or her deficiencies. The whole school was weak in decimals, and I did not even realize it until the tests proved the fact.

The second time I gave the tests I put aside every study and gave them all in two days. I did not let the pupils know that they were coming until the morning we began work. When their graph cards came back the last time the children could hardly wait to see them. They are going to make copies of the cards and try "on their own" to come up to standard in every subject in the spring term.

It is the spirit we want — the spirit of fair play, competition, and desire to work hard for a definite goal. I hope every teacher in the district has found her work with the tests as inspiring and helpful as I have.

V. L. W.

I think that standardized tests are the greatest boon that has ever been invented for the benefit of teachers, especially for those who are interested in, and conscientiously working to obtain, the best possible results with each child.

These tests save the teacher both work and worry — the former by having the questions prepared and valued without aid from the teacher, and the latter because the teacher now has the comfort of knowing that even though Helen may fall a few points below grade when the scores are added, it is no fault in reckoning valuation of questions and exercises or in computing ranks. There is proof enough even to convince an irate parent if occasion demands.

Furthermore, standardized tests show a teacher where the weak points are in the pupils' work so that she can conserve time and effort by drilling each child upon the particular line of work in which he or she is below grade, instead of upon the curriculum as a whole without regard to the standing of individual pupils in particular studies. Without the tests there is no accurate way of telling what grade a pupil belongs in.

Last, but not least, these tests show a teacher whether she is gaining or losing in skill according to the progress made by children of average ability under her control. This knowledge, either way, has proven a stimulant to me, as I have been able with my superintendent's aid to, in part at least, correct many faults and realize others that need to be corrected in order to make my teaching more efficient.

L. E. M.

I have become a firm believer in standardized tests. During the two years they have been used in my school, I have found them to be a source of help and an incentive to better work on

the part of the pupils. I consider them a fair test of the ability and progress of the pupils both individually and as a school.

By means of them, the teacher is able to discover readily the weak points in the work of her pupils. This enables her to know which pupils need special help. By giving this special help she is enabled to raise the standard of her school as a whole as well as aid the individual pupil to keep up to grade.

To me, another proof that these tests are helpful is the fact that they create a marked degree of enthusiasm on the part of the pupils. They look forward eagerly to the "testing time," each one eager to do his or her best. I believe that the enthusiasm thus aroused is a stepping-stone to better work and, therefore, to better results, the goal for which we, as teachers, are striving.

A. N. H.

Standard tests have helped me first, because they determine what points in each course of study need the greatest amount of emphasis and drill. Of course, that does not mean that we should drill on the exact material used in any of the tests; for that would be unfair to the test by rendering it valueless for accurate measurements. However, they do point out the *kinds* of things which should receive most attention in the case of a particular pupil, class, or school.

Too often in rural schools the grading has been left to the teacher's judgment — quite frequently to the judgment of a teacher untrained and inexperienced. How can such grading be uniform with no set standard for a guide? While the State Program outlines the courses of study for each grade, it does not set any standards of speed, accuracy, and thoroughness with which the work shall be covered. Here again, standard tests solve the problem. They prevent us from trying to produce expert accountants as well as from allowing children to fall into the slipshod habit of using all the time they desire for a task.

Every teacher has certain weak points. That is, her teaching ability is of a higher order in some subjects than in others.

But how can the teacher herself be made to realize her failings? Certainly not always from her own observation, for self-criticism is bound to be lenient. She may resent the most tactful criticisms from others, but she must realize that the standards set by thousands of children are not unreasonable for the children of her school and that if the majority of them do not attain to these standards, she herself is chiefly at fault.

Tests which determine the mental ability of the individual child are invaluable. Much worry and nervous strain on the part of the teacher as well as of the child may be avoided by study of the results obtained from such tests. It may be said that from daily association a teacher is able to gauge accurately the pupil's grade of mentality, but in many cases this is proved to be incorrect. A mental examination is as important as a physical examination. The teacher may expect too much of a pupil who is utterly incapable of doing the work required of him. In this case the child becomes discouraged — sometimes nervous — and unable to learn even to the extent to which he would be capable under conditions normal to him. On the other hand, the teacher may fall too easily into the habit of allowing the mentally deficient child to fall below his own standard.

Some children seem to be in a state of mental lethargy from one cause or another and need some slight stimulus to arouse their better ability. The test, being something unusual, often arouses their interest and unconsciously they use their ability to think. Once the results are obtained, it is, in many cases, an easy matter to get better results all around, merely because of knowing that the child is capable of better things.

Finally, it seems to me that the results received from the use of standardized tests showing progress or lack of it on the part of pupils are a much fairer means of judging the teacher's ability than mere observation or hearsay. Results count, no matter what the method. H. H. E.

I heartily believe that the standardized tests are of inestimable value to my school. The children realize the benefits

derived from the tests and are always eager to see their graphs as soon as their scores have been recorded.

Since it is an acknowledged fact that the general aim of education is social efficiency, it is up to us as teachers to place a great amount of stress on the "tool" subjects. In these subjects certain standards have been established so that we may know when our pupils have acquired the desired proficiency in each subject. Through these standards it is possible for us to learn many things: first, the weak spots in our teaching, so that we may know to what part of the work we should give more emphasis and drill; second, the tests enable us to select the individual pupils who need our special attention in certain subjects; third, the comparison of my graph cards with those from other schools certainly proves a motive for better work on my part and the same thing proves true when the individual pupil compares his graph card with that of his classmate; fourth, through the results of the standardized tests the superintendent and the public in general are, or may be, kept in close touch with the everyday work of the schools. Thus, if we do our best, and that best is good, we are rewarded for our efforts by the appreciation of those interested in the betterment of education, as well as by the knowledge that we are doing something really worth while.

In conclusion, I feel safe in saying that the standardized test, as a means of scientific measurement, is one of the greatest contributions ever offered to education.

E. M. W.

After a fairly long experience in a single grade, I found myself facing the problem of rendering sufficiently elastic to cover seven grades the minutes and the mental energy formerly devoted to one. The problem, to me, did not become any easier from the fact that the school was under unusually alert supervision. Also, my experience has bestowed upon me a number of things, among them a knowledge of what is due the children and a fairly accurate idea of my own limitations. I will pass over the adjustment period, at the beginning of the

term, to that which I at first considered as merely another "superintendent's hobby," standardized tests.

Now a little enthusiasm is a much more constructive emotion than mild toleration, especially in dealing with the inevitable, so I met the tests with what I could command on short notice. To-day I consider that the tests have been a great help in facing the single schoolroom of many grades. How much might they not accomplish in one grade in the development of different groups within the class! Most teachers know that no program of classes can be iron-bound and successful at the same time. Right here came my first great aid from standardized tests and the resulting graphs. They enabled me to adjust the program to the needs of this particular school as a whole. Then as a study of the graphs revealed the strength and weakness of individuals, weak points were the subjects of special attention. For instance, in grade four, Ann, Lucy, and Tom readily understand anything that they are able to read, while James and Edith are slow in grasping the thought and often do not arrive at all. James and Edith are given much personal drill, while the others are kept at attention that there may be no regression on their part. On the other hand, Lucy and Tom are held rigidly to account when it comes to number work. Thus the limited time may be used to the best advantage.

George's graph disclosed the fact that, with an intelligence quotient of 112, in multiplication and subtraction he was far below grade. This indicated need of drill in these two essentials which was faithfully administered. George's graph line is now rapidly approaching normal. I discovered that the reading vocabulary and the history of the entire school were considerably below my personal estimate of the facts. Again the proper remedy was indicated by the graphs.

Further study of the graphs brought to light a number of points below grade in problem work. A consideration of the intelligence quotients, followed by a little introspection, placed the blame squarely at my own door.

Thus these tests, given at definite periods, act as a sort of

efficiency expert to hold us to account. They uncover our weaknesses and by way of encouragement show us our good points. They also are of considerable tonic value. They offer a definite goal and I find that they are the subject of a very genuine enthusiasm among the children.

Personally they are satisfying, as they are a protection against the unfair and difficult tests given by the average superintendent or teacher. If one has had any experience with superintendents' "unstandardized tests," it is gratifying to feel that one's pupils are being held up to a standard which has been carefully worked out among many children and is entirely possible of achievement with a reasonable expenditure of time and energy; that, and the knowledge that the mental age and general intelligence of each pupil is considered, contributes a serenity infrequently associated with the "examination" period.

As time goes on, the tests themselves will probably vary and improve. If widely adopted they will render our educational procedure more uniform in efficiency; and children with parents of nomadic tendencies or changing business affiliations will not suffer so great a loss of time, pride, and ambition of being "put back" every time they enter a new school.

G. E. D.

I certainly think that the standardized tests are fine. They are a great benefit to the children. I find that a child who takes the standard tests two or three times a year does much better work, and also does it much more quickly. The children enjoy them; at least mine do. Instead of dreading an "examination" as they used to do, they are simply overjoyed at the prospect of taking a "test."

A teacher cannot, by means of ordinary examinations, know how her pupils compare with other children of the same age and grade in other schools, but by using the standard tests she can determine their relative standing and whether they need extra time devoted to certain subjects.

Of course they make extra work for the teacher, but if she

has the welfare of her pupils at heart (as every teacher should have) she will not mind extra work.

I have been a teacher for twenty-nine years and never heard of the tests until two years ago, since which time I have been using them under the direction of Superintendent Brooks. I should not care to teach again without them.

G. E. S.

This last tribute to the efficiency of standardized tests comes from a teacher who has just finished her twenty-ninth year as teacher in the same little rural school. Up to two years ago her own education was limited to the eight grades of the very school she has been teaching so long in her home district. She attended the summer session of a normal school last summer and is planning to go again this summer.

When I asked the teachers to write their opinions of standardized tests, I also asked them to have all the children above the fourth grade write what they thought of the tests. Below are a number of the papers submitted by the children. With the exception of corrections in spelling they are submitted just as the children wrote them, with no attempt to smooth over the crudities.

These are not selected papers chosen for effect. They were picked out from the nearly two hundred papers received in such a way that each school would be represented by two papers. The papers from each school were thoroughly shuffled and then the third and seventh papers from the top of each pile were taken for publication.

What the Pupils Think of the Tests

The tests help us to learn. I think I have improved since the last test. I was below grade by the tests the first time, but came up this time. They tell me I must work hard on the fundamentals of arithmetic and spelling and reading. I am

going to try to go up again next time. I like the tests very much.

E. E. W.

I think the tests have helped me in many ways. They have helped me to work both faster and better, and I have more interest in getting ahead in my studies. I like all the tests, but I like the arithmetic tests best.

L. M. D.

I like the tests very much and I know that they help me in many ways. The arithmetic tests are very nice and I improved a lot in them. I was sorry to find that I did not come up to my grade in addition and division on the last test, but I am going to see that I come up to grade in them next time. I was glad to see that I did much better with the tests this time than I did the last time.

D. L.

I like the tests because I think they help me to do better work. The first time I took the tests I ranked way below my grade, but the second time I came up nearly to where I belonged. The last time I found I was behind in the reasoning test and the language tests.

T. V.

The tests we have had have helped me very much, especially the arithmetic tests because there were so many different kinds of examples. I did not come up much in the reasoning tests, but I am going to work hard and get a better graph next time. The Hahn-Lackey Geography Scale helped me greatly. I like to study it. Then when I study in my books I can pick out the important things better.

G. H. M.

I improved on the tests very much. I like the tests. The first time I had them I measured below my grade, but the

second time I had them I did very much better. I had to work very hard on multiplication and spelling. I was very pleased when I saw my last graph card.

A. W.

I think the tests are a great help to us. They teach us to work quickly and correctly. They show us what we need the most. On my graph in some things I was below my grade so those are the things I have got to study up on. I was below my grade in writing. I had to work mostly on Geography and History.

V. M.

I have done better in all my lessons since we have been having the tests and I think they are very nice. Since we have been having the tests if one was in the third grade and belonged in the fourth he is put where he belongs and I think that is right. I like the arithmetic tests best, but I like the rest of them too. I am always glad when it is time to begin our tests and am sorry when we have no more. I was weak on some things and now I know what they are and am going to work up on them.

R. L.

I for one in this school do not like the standardized tests. It is true that in some ways they help us, but in some ways they do not. They help us to work quickly, but how about accuracy? We do not have time to think, and put down things that after we do think we know are not right. Some of the tests that help me are Reading and Grammar, but Arithmetic I hate and always shall. I think the standardized tests are more beneficial to the younger scholars than to the older ones. I hope they will stop having those tests as they get on my nerves.

F. M.

I think that the standardized tests are a great help to us. We can tell by looking at the graph card what grade we are in

and whether we are in the grade that we should be in. They help us, for we compare our graph cards with those of our classmates. When we are given standardized tests we know that we are rated fairly. A. H.

The tests help us to compare our work with our classmates, with other classes, and also with other schools. When we get our ranks from the graph cards we know what studies we need to study more. We also know that we are being rated fairly.
W. A.

I think the tests are very good for us. They tell exactly where one belongs, and one don't get put above his grade or below. It helps the teacher too, for they do not rank us by guess. The mixed fundamentals are good because they show us whether we can do arithmetic all mixed up or not. But best of all I like the standardized tests in Geography, especially those upon states and cities. I do not like the spelling test at all. It is more like dictation work to me. I hope I make my grade by these tests this year. The standardized tests are surely a help and I hope we will have them all the time.
R. K. L.

I think the standardized tests are the best kind to have. They tell us where we pupils belong and what we have to work up on. They tell us what we are weak in. They can't push us ahead if we don't belong there. The Mixed Fundamentals are exactly what we need. I like them very much. I don't know of anything better that we could have. They tell us what grade we belong in. I have done much better with them than I did last year. H. A. D.

I like the standardized tests. I think they are just what we need. I like the arithmetic best. The tests put us where we belong. I like the tests better this year than I did last year. I think I did better in the tests than I did last year too.
J. F.

I think the tests are very fair. Some of them are just what I like and some of them are not. The Mixed Fundamentals I do not like. I did not have them when I first began to come to school. I like them better than the old tests.

S. F. L.

I like the tests very much. I think they are fair, too. I like to take the Geography tests better than the others, but I think I will like the others after I know more about their subjects. I don't like the Mixed Fundamentals. I found I was below my grade in long columns of addition. I like the grammar tests, but not quite so well as the others. I hope I will get my grade in everything next term by the tests. They are very interesting and I hope we will have them always because anybody can tell just where she is. It gives us more courage to do our work well.

M. L.

I think the standardized tests are very interesting and also think they are the fairest of any tests I ever took. I enjoy them very much and hope they will continue to use them. They tell exactly where a child belongs. I don't like the Mixed Fundamentals very well. I found when I took the tests I fell down in long division. I hope that I get my grade next June so that I can be promoted.

E. G.

The tests are valuable to me because I compare my graph card with my classmates and if I am behind in anything I try to study harder to keep up. One class may be behind the other. They try to keep up with other classes that are ahead of them. It helps us to keep up with other schools because they can compare our school with others. And we know we are rated as we should be by standardized tests. L. D.

I think that the graph card which is a record of the result of Standard Tests, is a very good idea. I can compare my

graph card with that of my classmate. By looking at my card I can tell what studies I am below my grade in, and so know what subjects I need to study most. E. G. H.

The graph cards which tell the results of the tests are a great help to the pupils because we can compare our marks with those of our classmates and it tells us whether we did as well as our classmates or better, and how much. It also tells us in what studies we went below grade so we know what to study harder. It helps the teacher because they can find out what to let us put more time on. It helps the superintendent because he can compare our school with another. It helps the public because they can tell what the schools are doing. We know when we take the Standard Tests we will get fair play.

E. M. G.

I think the standardized tests are a good thing. They show you where you stand in your studies and whether you are keeping up in your grade or not. They help you to work with greater speed and accuracy. They are of benefit to you because they show how much you can get out of a lesson. They show you that, if you can't keep up with your grade, you can fall back into a lower grade. They also show you whether you are far enough advanced to be put in a higher grade.

I. M.

I think the tests are a great help to me and some special ones like addition, subtraction, and Mixed Fundamentals have made me quicker in my work. I like to do them. They help me in my everyday work. I can add and subtract quicker. If it was n't for them I would n't know whether I passed my grade or not. I would like to have them every day. I think it is fun to do the tests.

A. H. M.

The tests the teacher gives us are very easy. We are allowed five, ten, and sometimes twenty-five minutes. The tests I like

best are reading and History. I do not like arithmetic as I cannot remember my tables. The tests are a very good thing for every girl and boy in school, as they show them if they are above or below their grade. I do not sympathize with the school children or teachers, as I hate going to school. I can learn more by reading library books and going to places.

E. M.

During the past two years, since we have had a superintendent, we have had standardized tests which I have enjoyed very much, especially the Courtis Geography tests, although I should like to have them more often. They are all very helpful. The Courtis Standard Practice Pads that we have every morning help to develop speed as well as accuracy. I am especially interested to note the progress on my graph card.

J. L. C.

I think all the tests are very interesting and helpful. We shall be glad when the tests come again in June. Then we can see if we are going to be promoted. M. R. D.

I did not enter this school until late last fall because my parents just moved here from Providence, Rhode Island. All of the other children had been given the standardized tests before I entered, so the teacher gave them to me to determine what grade I should be in. When I got my graph card back it showed just where I belonged. These tests help me to think more quickly and I can see that they have been a great help in many ways. We have the Courtis Arithmetic Practice Pads every morning. All the children seem to be very interested in the tests and their results as recorded on the graph cards.

P. N. G.

We have only had standardized tests in our schools for two years. When our superintendent first brought these tests to us we were not very much interested, but since our teacher has explained the results on our graphs we have become very much

interested indeed. The tests that I enjoy most are the Student's Record and Practice Pad by Stuart A. Courtis, the Fundamentals of arithmetic by Clifford Woody, and the Silent Reading tests by Walter S. Monroe. I would like to have these tests more often than three times a year.

H. L. A.

I like all the tests that we have had only I would like to have them more often than we do. Of all the tests I think I like the Courtis Silent Reading Test the best. We think that it is great fun and would like to have them every day if we could. The Courtis Practice Pads that we have every morning have helped me more than any other. Can't we have some more tests that can be given every day? W. F. G.

The standardized tests have helped me in various ways, to think quickly and to read rapidly and silently and yet get the meaning of what I have read. They tell exactly what I am expected to do and in that way help me not to be careless, because if I look at the top of the paper and what it says there I know what to do. If I did n't look I would do something wrong. For example, if it said to subtract and I did n't pay any attention to it and multiplied, I would get the example wrong. The tests seem to me something like a game; trying to do something in so many seconds or minutes and get it correct. I do not mind them as much as tests which the teacher makes up and gives me because it seems as though she takes the very hardest things she can for me to do and gives the others something much easier. But with the standard tests there are just as hard things for one to do in my grade as another. E. G.

I like the tests very much. I like the spelling and reading tests best of all. I am always glad when the tests come round. I think the tests are very nice and helpful. I enjoy them very much. I try to improve each time we have them.

E. J. D.

I like the tests and am always glad when they come round. I think it is hard to change over to the new way of writing, but I am trying to do it. I hope I shall do better in my next test. I like the arithmetic tests best and the English tests the least of any. I think they are all very helpful. M. I. S.

I am always glad when we have the tests. I try to do better every time they come round. I like them very much. I like the arithmetic the best. I think the tests are a very nice thing and I think they help us a lot. I hope we have some more very soon. E. M. S.

The above papers are, I think, fairly representative of the opinions of the school children of this district in regard to standardized tests. Is there not a convincing sermon here for the educator who is not too much addicted to spinning beautiful theories out of his head to be a student of child nature? Is there not a lesson for teachers and superintendents who are willing to seek the child's point of view in order to make the teaching process more efficient by taking advantage of his likes and dislikes?

At any rate, the papers show that the children have grasped and appreciated the principal advantages that the use of standardized tests has for them. To sum up, they appreciate them as interesting, as motivating, as eminently fair, as setting up definite standards of achievement to work for, and as giving them a means of comparing their work with that of their classmates.

The record of the progress of pupils as measured by standardized tests and recorded on the graph cards, together with the testimony of teachers and pupils as above set forth, seems to me to be conclusive evidence that the use of standardized tests is tremendously worth while in rural schools or in any other school for which they are available.

CHAPTER XI

READING AIMS AND METHODS

Modification of Methods and Materials is Part of a Testing Program

Although standardized tests may be ever so useful in discovering the performance of pupils relative to grade norms, in helping to decide when pupils are ready for promotion, in determining the efficiency of teachers, and so on, nevertheless the benefits of a systematized testing program cannot be fully realized unless a careful study of results leads to the modification of the methods and materials of instruction in such a way as to improve the quantity and quality of classroom products. The carrying-out of such modifications and the retesting to measure their effectiveness is as much a part of an intelligent testing program as is the measuring of progress or testing for diagnostic purposes. Indeed, what is the use of diagnosis without follow-up treatment? For a physician to say that a patient has pneumonia is of little consequence unless he administers the proper treatment. And what would be the value of medical records of cases if the records did not contain descriptions of the procedures following diagnoses and of the results of such procedures?

It may seem at first thought that the topic " Reading Aims and Methods " is beyond the scope of this book. But the reading methods and materials now in use in this district are so directly the outgrowth of efforts to remedy the conditions revealed by tests of silent-reading ability, and so essential do some such methods and materials appear to be in developing silent-reading ability as measured by the tests, that I believe a detailed discussion of

them should be included in the exposition of any scheme for getting the utmost practical benefits from the systematic periodical use of standardized tests.

Drill in Oral Reading does not Ensure Silent-Reading Ability

A discussion of the conditions disclosed by the first tests is given in a previous chapter. The low level of reading efficiency revealed throughout the district by the results of these first tests was conclusive proof that the customary oral-reading drill was not developing the sort of reading ability that the tests measure. Yet the tests measure the kind of reading ability that it is most important for the pupils to acquire, namely, the ability to gather ideas silently, rapidly, and accurately from the printed page. Teachers, however, habitually try to develop reading ability through practice in word-pronouncing, supplemented *sometimes* by more or less efficient drill in enunciation, articulation, and proper expression. By the end of the eighth or ninth grade, most pupils have learned to recognize and pronounce a sufficiently large number of words to enable them to give at least a phonograph-like rendering of untechnical printed matter — minus in most cases the intelligent expression which a phonograph reproduces so perfectly. Since the chief measure of reading efficiency is the teacher's judgment of proper expression and pronunciation regardless of whether or not the words and sentences read mean anything to the reader, this oral evidence of the ability to translate printed symbols into the sounds which they represent is misconstrued into evidence of real reading ability. Indeed, when we *measure* oral-reading ability — as we do by means of Gray's test — we estimate the performance of the pupil solely on the basis of the way he pronounces the words.

This may account for the fact that so many pupils with fair oral-reading ability can do little more with the content subjects than to give parrot-like repetitions of facts memorized from the texts. We ask teachers to assign project-problem work to the upper grades in geography, history, and science. They reply that most pupils, even when they have full instructions and outlines to work by, are helpless in carrying on anything like independent study, and that rote memory work seems to be the limit of their achievement in these subjects. If this is a true statement of the case, we are rightly led to inquire whose fault it is that upper-grade children cannot read with understanding.

To be sure, some of the more intelligent pupils really learn to read, not because of proper drill and instruction, but because of superior native ability. Such pupils are actuated by the necessity of reading for comprehension in learning their geography and history lessons, and by their love of books in general. They do much silent reading outside of school. In other words, they learn to read mostly through self-imposed practice in silent reading. Accordingly, since some pupils in time learn to read in spite of poor teaching methods, and since most pupils learn how to pronounce a few hundred common words, a false idea of the efficiency of oral-reading drill has long persisted — an idea fostered by wrong aims in teaching and a lack of intelligent method in measuring results.

The Way to Improve Silent Reading is to Teach Silent Reading

Lately, however, the revolutionary idea has occurred to some people that the most efficient way to teach reading is by actual class drill in reading and not by practice in speaking as heretofore. Strange, is n't it, how long it has

taken even a few school people to reach such an obviously sensible conclusion? Yet music teachers have always known that piano playing could be taught much more effectively through actual piano practice under instruction than by means of singing lessons. Moreover, one does not teach children to swim by giving them skating lessons.

After considering all the reasons we could think of for the almost universally poor reading ability revealed by the scores in silent-reading tests, we decided that the chief reason was that the pupils had never been drilled in that kind of reading. Oral-reading drill, and that very poorly conducted as a rule, was the only kind of reading drill they had ever known. It had, of course, failed to develop the type of ability measured by the standardized tests. Other contributing factors were lack of vocabulary knowledge, as revealed by the visual vocabulary tests, and bad habits of silent reading, such as lip movements, which prevent the attainment of speed.

Oral-reading drill does not ensure the development of silent-reading ability because the mental processes involved, and hence the brain centers brought into play, are very different in the two kinds of reading. It is a good deal like trying to develop the muscles of the arms through exercising the legs. Furthermore, oral-reading drill does not, as has been shown, ensure the pupil's understanding of what he reads. A pupil may be able to pronounce the words of a passage perfectly; he may also, through a mechanical minding of punctuation, convey the author's thoughts to the hearer without himself comprehending them at all. Yet comprehension is one of the two main factors of efficiency in silent reading.

The ability to recognize and pronounce words and phrases is no true evidence that their meaning is understood. A phonograph can reproduce perfectly the words

that are spoken into it, but surely nobody would argue from this circumstance that the words have any meaning to the machine. Just so can the child repeat words which have been pronounced for him by the teacher without having much conception of the ideas which the words represent. He can become so familiar with their visual forms as to recognize them instantly on the printed page and pronounce them in consecutive order so that they can be understood by others, and still they may have almost no meaning to him. This point will be clear to any one who has acquired during his high-school days a reading knowledge of a foreign language, and who has given it no thought for several years until his vocabulary has so nearly faded from memory that in scanning a printed page of the language he can find only here and there a word that means any more to him than a jumble of letters and sounds. Yet he can pronounce most of the words as well as he ever could and can probably read the whole page orally, although with poor expression due to his inability to grasp the thought. There is a rather close analogy between such reading by an adult and the hesitating, expressionless oral reading of a child who does n't grasp the meaning of what he is reading.

We must remember that words have no meaning in themselves. They are merely the visual symbols of ideas more or less common to the experience of the race. Until the learner makes these ideas his own through experience either direct or indirect, and connects them permanently in his mind with their visual symbols, the words can have no meaning for him, though he may be able to recognize them at sight and give correctly the corresponding vocal forms. So I repeat that skill in word-pronouncing is not conclusive evidence of reading ability, if we define reading ability as the ability to gather ideas from the printed page.

Oral-Reading Drill Hinders Good Reading

Furthermore, oral-reading drill acts in at least two ways to prevent the formation of proper reading habits. Perhaps it would be better to say that it tends to the formation of improper reading habits.

In the first place, the fact that the pupil when reading aloud must concentrate his attention on punctuation, enunciation, articulation, and expression, precludes the possibility of his gathering much meaning from what he reads. His mind is too much occupied with the mechanics of oral reading. If the reader is skeptical as regards this point, he might profit from a little experiment. Let him read aloud to some one, a page from Dewey's *Democracy and Education*, remembering that he is reading to an audience and that he must give as much expression to his reading as possible so that the audience may get the author's meaning. Then let him close the book and see how much he can tell of what he has read. After trying it, the discomfited experimenter may object that the text is too difficult for a fair test. But is Dewey's masterpiece any more difficult for the educated, intelligent adult than the ordinary school text is for the learner? Besides, the learner may be still further handicapped in getting the thought by childish self-consciousness and the constant expectation of being interrupted, corrected, and criticized by the teacher or his classmates. Have you ever considered how harmful to the thought-getting process must be those constant interruptions accompanied by wildly waving arms and hands where the reader is told that he can read until he makes a mistake and the class is told to watch for his mistakes? In oral-reading drill of this sort the habit is forced upon the pupil of paying more attention to forms of words than to their meanings. In silent

reading, however, this habit cannot but be a hindrance to him.

In the second place, in oral reading every word has to be pronounced, a procedure that in silent reading is not only unnecessary but positively harmful. It absolutely precludes the possibility of attaining a normal rate of speed. A good reader can read from two to four times as fast silently as he can orally because in reading silently he does n't have to pronounce words or even to consider single words. He grasps whole thoughts at a glance. But the per cent of such readers in the elementary schools is small. One may obtain ample proof that such is the case by going into any schoolroom during a study period in history, and noting the pupils who are not visibly pronouncing every word as they read over their lessons silently. True, most normal adults and some of the brighter children in the grades who read much do not move their lips in silent reading. But it is the fact that *such persons read much* that really accounts for their efficiency. This fact also shows that silent-reading ability can be developed by practice in silent reading. In other words, those who exhibit this ability have acquired it through much self-imposed silent reading rather than through school instruction in oral reading. And most of them learn to read too late to be of help to them in their school work. Beyond the third or fourth grade boys and girls need to use reading as a tool with which to acquire the information contained in books. Hence the recent movement to develop efficient silent readers during the first three or four years of school life.

A slow reader, then, is not an efficient reader and oral-reading drill tends to make slow readers by forming the habit of lip movement in word-pronouncing. I use the term "oral reading" not because it is appropriate, but

because it is the common designation applied to the type of drill in vogue during the "reading" period in most schools. Of course so-called "oral reading" is not really reading at all. It is word-pronouncing. Word-pronouncing is speaking; and speaking and reading are by no means synonymous terms. Their dictionary definitions bring out the distinction. Reading is defined as "the going over words or characters with comprehension of their meaning." Speaking is defined as "the utterance of articulate words or sounds."

The Case against Oral Reading

Accordingly, because it furnishes practice in speaking rather than in reading, I am trying to make out a case against "oral reading" as the sole or even the chief means of developing reading ability in school children. I am not condemning oral-reading drill in general as a useless and pernicious practice. Not by any means, even though, as I have shown, too much of it tends to prevent the formation of good reading habits. But I do say that oral-reading drill as often, if not as ordinarily, conducted is worse than useless as far as developing real reading ability is concerned. It is a criminal waste of the child's time and opportunities and a disgrace to those who practice it while professing a knowledge of the art of teaching.

We recognize the picture. A class of pupils is taking turns reading aloud from a book of which every one has a copy. The "lesson" has probably been read over and over by most of the pupils at their seats until there is nothing new in it to keep alive a vital interest during the class period. One after another each rises and drones out a paragraph or two, interrupted occasionally by corrections of too glaring errors from a yawning teacher or from classmates not so busily engaged in mischief or day-dreaming

as to be entirely oblivious of their surroundings. I have seen teachers correct papers, write letters, or put work on the board for another class while conducting (?) a class in what they termed "reading." The pupils each pronounced a paragraph, doing so in regular turns so that the teacher would not have to give her attention to stopping one pupil and starting another. Corrections and assistance in saying the words were left to supposedly alert classmates. In reality most errors went uncorrected and the reader skipped or stumbled over such words as he did not know how to pronounce. If things came to a complete standstill, the teacher would give her attention long enough to start them going again. All this in the name of education, with the public's money going to pay for it! Shall we ever have enough teachers, real teachers, to do real teaching in all our schools? It is such handling of "oral-reading" drill that I condemn and the practice does not need to be nearly as bad as described in order to be not only useless but positively harmful.

Yet Oral Reading has its Value

However, properly handled drill in the oral reproduction of printed words and sentences can be made worth while to the pupils. If the printed selections are used as material for intensive drill in pronunciation, articulation, and enunciation, then such drill has its proper place in developing proper habits of speech. Used in this way, it supplements (and should probably form a part of) the oral-composition phase of language work. But it is not reading, and should not be permitted to replace real reading drill or to encroach upon the time that should be devoted to real reading drill. Let us find a suitable name for it and give it a place in the program all its own if we cannot feel convinced that it is a part of the regular language work.

Of course there are, especially in cities and large towns, many schools with highly trained teachers where oral-reading drill is by no means so tragically inefficient as in the method described above. Such inefficiency in varying degrees is chiefly characteristic of the rural districts, especially of districts without expert supervision or wherein teachers through inherent inadaptability or acquired prejudice have failed to profit from expert supervision. In many school systems the defects of the traditional method have been largely remedied and oral-reading drill has been developed to the point where most of the possible benefits are derived from it. In such systems pupils are no longer required or even permitted to study their reading assignments at their seats. They read at sight fresh stories each day so that the important element of interest in something new and desirable is present during the reading period. Only the reader has a book. The others have to listen carefully if they want to get the whole story. Thus attention is held; especially if the teacher calls upon some member of the class now and then to repeat what he has just heard read. For the reader, the audience situation is provided. He is reading a new and interesting story to his classmates. He must read his best in order that they may understand him as fully as possible. Under such conditions the criticisms of his classmates, to the effect that he does n't speak distinctly or loud enough, are apt to be much more effective than formal criticisms by the teacher. But in spite of all improvements, oral-reading drill at its best cannot develop the most valuable kind of reading ability.

Oral Reading not Necessary for Beginners

There is a popular belief that oral-reading drill is a necessity with beginners. On the contrary, it is not necessary

and is probably productive of more harm than benefit. It is unnecessary because silent-reading methods can be used to good advantage from the very beginning. It is harmful because it starts to develop wrong reading habits in the child from the first. Furthermore, it is of little practical value even in developing oral-reading ability because no effective oral reading can be done until the child has acquired the ability rapidly to translate printed symbols directly into ideas. This ability can be developed in the young child only through much efficient silent-reading drill. Over-emphasis on oral reading in the lower grades is directly responsible for much of the stiff, stumbling, expressionless oral reading in the upper elementary grades and even in high school. We are requiring children to read orally before they have gained that proficiency in rapid comprehension which alone makes intelligent oral expression possible. Their minds, wrongly trained from the beginning, are often unfitted for efficient reading of any kind. Hence, oral reading should not be introduced too early in the child's school life.

The current contention, that emphasis on oral reading should be strong in the first grade and decreasingly so throughout the other grades, cannot be sustained on the ground that another procedure is not feasible. Neither can it be sustained on psychological grounds. The order of mental stimuli and associations is significantly different in the two forms of reading. In oral reading the visual symbol is translated first into its more familiar auditory symbol, the auditory image into an idea, and the idea into verbal expression. Indeed, with many children if not all, who have been brought up on oral-reading drill, verbal expression seems to be necessary before they can grasp the idea.

On the other hand, in efficient silent reading the visual

symbol is associated directly with the idea without the intervention of either auditory image or verbal expression. Efficient silent reading is the instantaneous association of printed words with the ideas which the words represent. The earlier we develop this habit of direct association in children, the sooner shall we make them efficient and intelligent readers. Too early drill in oral reading not only hinders the acquirement of this habit in early years, but injures the child's chance of acquiring it in later life.

When to Begin to Teach Oral Reading

Just how soon it is desirable to begin oral-reading drill is open to argument. In general it might be said that it should not be until the habit of direct association between words and their meanings has become firmly fixed. That would probably mean the third or fourth grade at the earliest. It might possibly be introduced earlier to a limited extent without great harm, provided care is taken to preserve the proper order of mental associations as explained later.

It is probably not advisable to drop formal drill in oral reading altogether, although extremists go so far as to advocate doing so. Something in the nature of drill in verbal-motor reaction to printed-word stimuli would seem to be necessary to the child's complete mental development. There must be drill in phonics and phonetics in order to develop in the child independence and confidence in attacking new words. There must be practice in word-pronouncing, not only for the sake of learning to pronounce new words, but also for the sake of building up the speaking vocabulary. This latter result is accomplished through developing mental associations between visual forms and auditory images. Nor can such practice be postponed beyond the age of easy and economical habit formation,

in other words, beyond the natural period for effective drill. But it should not begin so early as to prevent the formation of other habits just as important.

Why Silent Reading should be Taught First

We shall now turn our attention to silent reading. Why is it so much more important to develop silent-reading ability in the child than to develop oral-reading ability, admitting that oral-reading ability is a valuable accomplishment? And if both abilities are to be developed, why should silent reading come first?

It is more important because it is the type of reading ability that the child needs to use in studying history, geography, physiology, civics, and even mathematics beyond the bare fundamentals. It is almost the only kind of reading he will do after he gets out of school. It is probably no exaggeration to say that over ninety-nine per cent of the reading done by most adults is silent reading.

Silent reading should come first because oral-reading ability and silent-reading ability are, psychologically, two very different accomplishments, and, while efficiency in silent reading is a very necessary preliminary to good oral reading, effective drill in oral reading is, on the other hand, a positive hindrance to efficient silent reading. Why, then, should so large a part of the pupil's school time be devoted to acquiring an ability of so little practical use at the expense of failing to acquire another that is, beyond intelligent dispute, the most useful one that he can develop?

Silent reading has already been defined as the process of making direct mental associations between visual images and ideas, between printed words and their meanings, without the intervention of auditory images or verbal expression. It is the reading of meanings rather than of words. *Efficient* silent reading means much more. It

means *rapid and accurate* gathering of thoughts from the printed page. An efficient silent reader takes in whole thoughts at a glance and associates them instantly with previous experience while being scarcely conscious of the word-forms. He looks through the words and is conscious only of the ideas they express. That the rapid reader not only reads much more, but retains more of what he reads and understands it better than does the slow reader, is a fact so well proved that further discussion is unnecessary. Excellent psychological reasons are advanced to account for this fact. Rate and comprehension, the two chief factors in efficient silent reading, go hand in hand.

Silent Reading as Actually Taught

In progressive school systems, silent-reading practice is being given more and more the prominence it deserves in the elementary-school program. The methods and technique in most general use are, however, of questionable efficacy. Although the idea of the need of developing silent-reading ability early in the child's school career is spreading rapidly, little attention seems to have been given to developing rational special methods. Hence, many teachers have but a vague idea of how best to proceed to get good results.

Within the past two years I have visited a number of schools where it was rumored that the teaching of silent reading was a specialty, with the purpose of finding out how it was taught. Much of the work was being done by normal-school seniors as part of their practice teaching. The information I obtained was both surprising and discouraging. Most of the work I witnessed was almost as reprehensibly time-wasting as slipshod oral-reading drill. The only idea most of the teachers seemed to have of what constitutes silent-reading drill was that of having children read books or selections from books or periodicals silently

at their seats and then of having them give oral or written reports on what they had read. Some of them did not even call for reports. They merely accepted the child's statement that he had read over the assignment. Is that kind of silent reading useless? Well, no, not entirely. Almost any kind of reading is better than none. But as a means of developing habits of concentration and rapid comprehension I should say that it is, if not entirely useless, at least discouragingly slow. It is like waiting for the weather to wear away a granite ledge instead of attacking it with steam drills and blasting powder. I found the nearest approach to effective class drill in silent reading where some teachers gave their classes a definite length of time, say one minute or two minutes, in which to read a page from a story and then called on some member of the class to tell what he had read, while the others listened carefully to discover errors or omissions.

Merely Giving Children Books to Read is not Sufficient

Now, what is the matter with giving children books to read at their seats for silent-reading drill? In the first place, it is a waste of school time. It does not develop silent-reading ability to any great extent, and it takes time which can be used to better advantage. Such reading has its place if the material is worth while either from an informational or a literary standpoint, but it should usually be assigned for home work if assigned at all. It may serve as extra work for brighter pupils for whom the ordinary class assignments are not sufficient to keep their time profitably employed.

In the second place, it does not demand, or at least it does not force, that concentration of attention so absolutely essential to a complete and accurate understanding of what is read. Most of us have had the experience of

trying to read something in which we were not particularly interested while our thoughts tended to wander to more congenial subjects, or of trying to read something really interesting while some other matter weighed heavily on our minds. How many times have we read on, page after page, without comprehending a single thought of the author. The boy, dawdling and day-dreaming over a book at his seat with his thoughts continually wandering to the baseball field, is not getting much worth-while silent-reading practice. On the contrary, he is forming very bad habits.

In the third place, such practice does not develop speed, that highly important factor in efficient silent reading. In such reading there is usually little incentive for the pupil to read rapidly while at the same time concentrating his attention on getting the thought. Rate of accomplishment is a phase of performance that has been largely neglected in estimating the relative abilities of pupils, not only in reading, but in other subjects as well. For instance, ten problems are assigned to a class in arithmetic. Both John and James do them all correctly and each gets a mark of one hundred, although John does them in half the time that it takes James. Is such marking fair to John? He is in one sense twice as efficient as James in arithmetic and his school marks should indicate that fact. Similarly in reading. The pupil who can read three pages in five minutes and understand all that the author has said is three times as efficient a reader as he who can read but a single page with equal understanding in the same length of time. So unless we can find something better in the way of silent-reading drill than merely to give a child some reading to do at his seat and perhaps to require a written or oral report, it would be as well and probably better to stick to oral-reading drill for a few hundred years longer.

CHAPTER XII

SILENT READING IN THE LOWER GRADES

Reading, then, is the most fundamental subject taught in the elementary grades. Ability to read is absolutely essential to progress along almost every line of school work. Reading is the key with which the pupil unlocks the gates of knowledge; the medium through which he makes the accumulated information of the race his own. Hence the importance of developing efficient readers in the lower grades and our decision to give reading a place in our school program commensurate with its importance.

Must Develop the Kind of Ability the Tests Measure

It was obvious from the results of our first reading tests that if we expected to bring the schools up to the test standards for each grade, we must guide our teaching efforts so as to develop the kind of reading ability that the tests measure. That the customary oral-reading drill would not develop this ability, the reading scores of the upper-grade pupils furnished ample proof; for these scores averaged much below normal despite the fact that the pupils had had such drill for years. Besides, even the standard scores for the silent-reading tests are probably much too low, since they are derived from the results of testing children who have for the most part been taught oral reading.

After we had made an investigation of current practice in the teaching of silent reading and had studied the meager literature on the subject, it was equally obvious

that we should have to depend largely on our own inventive resources for a program and method that would offer hope of measurable results within a reasonable length of time. Accordingly, we evolved the plan which I am about to set forth.

The Success of the Plan Adopted

This program has not proved an unqualified success in every school or with every teacher. But in most schools it has proved reasonably effective, and in every school wherein the pupils average normal in intelligence and are taught by a teacher who has entered into the spirit of the work, it has proved effective beyond our most sanguine expectations. There are a few small schools in the district where the average mental level is too low to expect normal results under any method or any teacher. There are a few teachers who, either because of lack of teaching ability or unwillingness to coöperate whole-heartedly in the experiment, have failed to get better results. It has been impossible as yet to replace all of them because of the great shortage of teachers during the last two or three years. But I am convinced from the results achieved by our better teachers that, with a reasonably capable teacher, the plan will produce excellent results in every school where the pupils average normal mentality. At any rate, though by no means perfect, it has enabled us to bring most of our schools up to the grade standards of Monroe's Silent Reading Test within the year and a half during which it has been in operation.

Reading in Grade I

It was a great step in advance when teaching the alphabet was discarded as the initiatory step in teaching beginners to read, and when the teaching of whole words, phrases,

and sentences was substituted therefor. It will be another great step forward when the elimination of verbal-motor expression in primary reading work becomes general. The first problem confronting the teacher with a class of beginners is to help them acquire a visual vocabulary while at the same time forcing them to make direct associations between printed words and the ideas they represent. The only way this can be done is to eliminate as far as possible in class drills the pronunciation, either by teacher or pupils, of the new words being presented to the class. Whenever possible teachers should indicate the meanings of new words by other than verbal means, and the pupils should indicate their understanding of the meanings without actually pronouncing the words. Of course, it is impossible to do away entirely with verbal forms and auditory images because there are many common words, such as articles, prepositions, conjunctions, abstract nouns, with their adjective and adverb derivatives, and verbs other than verbs of action, which cannot be introduced economically if at all in any other way than orally. But the teacher can exercise considerable ingenuity in trying to teach the meaning of a word before having recourse to pronouncing it and explaining it orally.

Now, to what words in visual form shall we first introduce the beginner in this process of vocabulary-building? Obviously to the words belonging to the speaking vocabulary which he has already acquired. To begin with, there is a large number of words which we can be sure are common to the vocabularies of most seven-and-eight-year-olds who have been brought up under normal conditions in this country. Many other words known in general to the particular group can be found by drawing the pupils into conversation or discussion and noting the words which they use and which all of them seem to understand. Not

until the possibilities of the children's own speaking vocabularies are exhausted is it necessary to turn to the vocabularies of books.

Teaching the First Words

Let us suppose that the teacher has chosen for the first lesson a list of ten words which she is sure corresponds to a part of the stock of ideas common to all the children in the class. The list might be as follows: *boy, girl, the, run, jump, sit, chair, pencil, book, desk.* How is she going to teach the meanings of these words without pronouncing them or permitting the pupils to pronounce them? To begin with, she should have each word printed neatly on a separate card about a foot long and three inches wide — large enough at least so that the printed word can be clearly seen by the entire class at one time. Such cards are similar to the ordinary quick-perception cards; but their use is quite different from the usual use of quick-perception cards. Generally such a card is flashed for an instant before the pupil's eyes. He is then supposed to recognize it and respond with the vocal form. This vocal response, however, is just what we want to avoid at first. The better way is for the teacher to begin with three words; as, *book, pencil, chair.* She exposes each word in turn while calling the attention of the class to the object which it represents. Then she goes over them again asking a pupil to point out the objects. This process is repeated with different pupils until the whole class is able to recognize the words as representing particular objects. Then another word is included, after illustrating its meaning; and the drill is repeated.

This procedure continues until all the words in the list are learned thoroughly. This may take one period or several. It is slow work at first, but it pays. Thorough-

ness is essential. *Run* and *jump*, being verbs of action, can be easily illustrated by the teacher. The word *the* must be told outright. The pupils are familiar with its use and need only to become acquainted with its visual form. Concrete nouns and verbs of action which are capable of easy illustration should constitute the bulk of the words taught during the first term, in order to avoid so far as possible the necessity of pronunciation and oral explanation. When words must of necessity be presented orally, there should be no more repetition of the pronunciation than is absolutely necessary.

Keeping the Right Order of Association

Not until a considerable number of words have been taught in this way, and the habit of forming direct association between printed words and ideas has been well started, should the vocal forms be used in class drill unless they cannot be avoided. Indeed, beyond what is absolutely essential, it is a question whether or not they should be used at all during the first half-year. But if it seems necessary to use them, great care should be taken to preserve the proper order of mental associations. Do not let the auditory image get between the visual image and the idea. The proper order, so far as reading is concerned, is: Visual Image, Idea, Auditory Image, Verbal-Motor Expression; not Visual Image, Auditory Image, Verbal-Motor Expression, Idea. It makes a great deal of difference, as regards the development of present silent-reading efficiency and future oral-reading efficiency, which order of associations is formed in the child's mind in the very beginning.

Hence the importance of getting the direct associations between words and their meanings before verbal expression is permitted in connection with the class drill. The proper

order of associations can be maintained by the above-described process of vocabulary development preceding the oral naming of objects or actions. When a strange word is presented to a child, it means nothing to him, although he may be perfectly familiar with the object which it represents and the spoken word which stands for it. If the teacher points to the object instead of pronouncing it, the printed word is first associated with its meaning in the child's mind. Although, if the idea is familiar to the child, this association immediately calls up another previously formed association, namely, that of the idea with its auditory symbol, nevertheless the association of the visual form with the idea has been made first, and thus the proper order of associations has been maintained. To illustrate, suppose the teacher holds up a card with the word *desk* on it. The children have never seen the printed word before. It means nothing to them, although they know perfectly well what a desk is, and how to say the word. There has been no association formed between the printed word and its meaning. Let the teacher point to the word and then to a desk, and instantly the association is made, and followed instantly by the auditory image which tends toward verbal-motor expression unless the latter is repressed.

But suppose the teacher pronounces the word for the class instead of pointing out the object which it represents. The children know instantly what it means because association has been previously formed between the idea and the spoken word. But here the spoken word intervenes between the printed word and its meaning, thus setting up an order of associations which is wrong from the point of view of reading. This is just what happens when quick-perception cards are used in the ordinary way Moreover, when this oral method is used, children may learn through imitation of the teacher to recognize and pronounce new

words without grasping their meanings. Suppose a card is shown with a word representing an idea wholly outside of the child's experience. The teacher pronounces it and the child pronounces it after her. In time he learns to recognize it and to pronounce it correctly when he sees it either on the card or in a book; but, wherever he meets it, it has no meaning for him. The method here suggested ensures that the child will get the meaning of every new word. If we *must* teach the vocal forms of words along with their visual forms, let us first make sure that they know their meanings by some assurance other than oral before they are asked to pronounce them.

Teaching Sentences

As soon as a sufficient number of words have been learned by the class, the teacher should begin to make use of short sentences made up of the words already learned from the quick-perception cards. In order to avoid so far as possible the necessity for oral reading, these sentences should express simple actions which children can perform in the schoolroom, or ideas which permit them in some other way than orally to express their complete understanding of the thought of the sentences. Below are a few examples of such sentences.

1. Open the door.
2. Show me a pencil.
3. Go to the window.
4. Pick up a book.
5. Sit in the chair.

A pupil can easily express his understanding of such sentences through action without speaking a word. Not until he has performed the act expressed by a sentence, if at all, should he be asked or permitted to read it orally.

This is real, efficient silent-reading drill which can be used effectively with the little ones after the first three or four weeks of vocabulary-building. Some people hold that oral reading is absolutely necessary in beginning to teach reading; except through oral expression, they conceive of no way of knowing whether or not a child is making proper progress. Our experience, however, with the method I am describing shows that oral reading is emphatically *not* necessary. Besides, one must remember that oral expression is no safe indication of progress in reading ability, because it does not prove understanding of what is being read. The drill described above does prove such understanding. If a child, after glancing at the first sentence, walks to a door and opens it, he proves conclusively that he understands the sentence.

Of course, this method of teaching reading cannot be expected to appeal strongly to the type of teacher whose chief interest is in her salary. It demands considerably more thought and effort on the part of the teacher than does the customary oral-reading drill. She cannot crochet, or write letters, or even put work on the board for other classes while using it. She must plan her work ahead and be prepared from day to day with suitable material. She must go to the trouble of carefully selecting new words for the vocabulary-building drills and of printing them on cards for class use. She must devise and print large numbers of action sentences for the sentence interpretation work. Cheap manila cardboard, commonly known as "tag," should be furnished her for this purpose. A chart-marker should also be furnished for each schoolroom; but if this is not available, the printing can be done by hand with the rubber end of an ordinary lead pencil dipped in black drawing ink. The chart-marker is naturally very much to be preferred because it has the same letter

forms that the pupil will meet in the books he is to study later.

The Use of Pictures

To illustrate the meanings of all concrete nouns by means of *the objects themselves* is impossible. It would be rather awkward to import a barn or a locomotive into the schoolroom to illustrate the meaning of a word. Obviously the next best thing to the object itself is a good picture of it. So, the real live teacher, with efficiency in view, will make a collection of pictures with which to illustrate ideas to her classes. The papers and magazines are full of suitable material, and a picture of almost any object under the sun can be found in the big catalogues of mail-order houses.

These pictures should be pasted on small cards, and they should be kept neatly filed and indexed. Every schoolroom ought to have a filing cabinet for this purpose. After choosing the new words to be taught, the teacher should take from the cabinet pictures to illustrate their meanings if they are words whose meanings can be so illustrated. A word may be shown first and then a picture to illustrate it until all the new words have been thus explained as to meaning. Then the pictures may be spread out on a table, the words flashed in turn, and the pupils asked to pick out the proper pictures. This drill may be continued until all the words are instantaneously associated with their meanings as shown by the readiness of the children in choosing the correct pictures.

Probably there is no other device so efficient in vocabulary-building as the illustrated vocabulary. Something of this kind in particularly effective form for seat work is now sold by Milton Bradley & Co., Boston, Massachusetts. It consists of a series of cards about 4 x 5 inches, each card bearing a picture of some object. In each lower corner of

the card is printed the name of the object illustrated. The right-hand lower corner with one of the words on it is cut out. The cards and the cut-out corners are all shuffled together and it is the pupil's task to match the words on

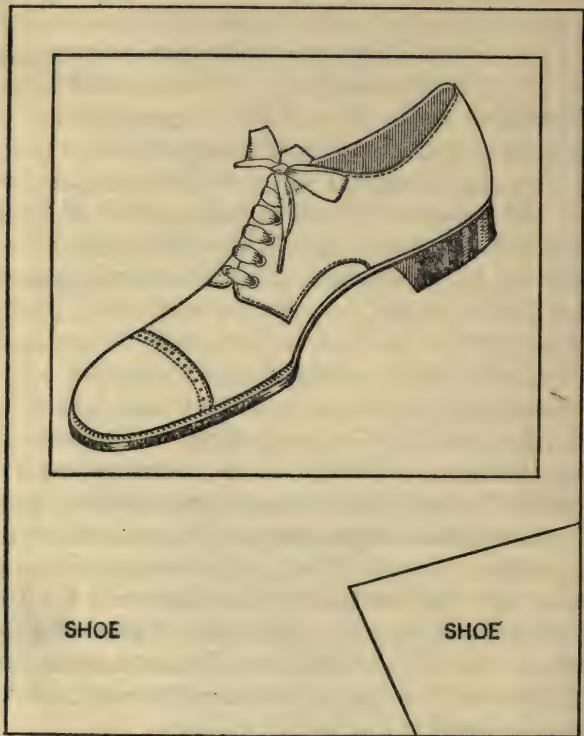

Fig. 13

the cut-off corners with the words and pictures on the cards, putting the corners in the places from which they were cut so as to form complete cards. The accompanying figure will make plain the idea.

This plan is excellent, but the range of words so far illustrated is much too limited. If the range could be extended to include five or six hundred of the common words capable of pictorial explanation, it would be a wonderful help in the teaching of silent reading in the lower grades.

If I remember correctly, the scheme is self-correcting. If not, it could easily be made so by varying the shape of the cut-out so that it would fit only the card from which it was cut. With this self-correcting feature there would be no need of a printed word on the main card; and I am not sure but that it would be better to omit it. If it is not omitted, it may well be that pupils will fit the corners by matching words without having their attention particularly attracted to the picture which illustrates the meaning of the word. In fact, with the word printed on the main card with the picture, there is no very strong incentive for fitting the corners at all. With this word omitted, the game would be to fit the corner in order to find out by the picture what the word on the cut-out means.

Reading from Books — Little good Material Available

The drills in vocabulary-building and sentence-interpretation described above should be continued throughout the first half-year, or until the children have acquired sufficient vocabulary and reading ability to read a simple, short, connected story from a book and then to tell the story in their own words. Then it is time to begin reading from books. And right here is where we meet with the first real difficulty in teaching silent reading to beginners. The difficulty exists simply because the reading material in primers and first readers is mostly unsuited to class drill in silent reading. Here, for instance, is a selection from a certain first reader.

"Mary is making a pancake.
It is fun to mix a pancake.
It is fun to stir a pancake.
Pop it in the pan!
See Mary make a pancake.
See the pancake in the pan.
It is fun to stir a pancake.
It is fun to pop it in the pan."

Imagine asking a little child to read this silently and then tell the "story" in his own words! There simply is n't any story to it. Here is another gem from near the end of the same book:

"This is a rainy day.
I cannot go out to play in the rain.
I see the organ man, Susan.
The organ man is playing in the rain.
Here is a penny, Susan.
The organ man will play for a penny.
Run to the door and give the organ man this penny."

This is not much better. The rhymes are even worse for silent reading purposes. Yet these are representative samples of the incoherent contents of most modern first readers. The primers are even greater conglomerations of unrelated nonsense. Some of the material may be worth while as literature, interesting to little children, and perfectly adapted to oral-reading drill. But it is n't oral-reading ability that we want to develop at this stage. We want to develop silent-reading ability, and for this purpose such material is not at all suitable. In fact there seems to be little material simple enough to be available for first-grade use that is also suitable for silent-reading class drill in that grade.

An Example of Usable Material

I have just finished examining seven primers and ten first readers in an attempt to find some pieces with which to illustrate silent-reading class drill for little folks. In but one first reader did I find a few simple stories coherent enough to make sensible reading, and they are largely spoiled for my purpose by containing too much direct discourse. For direct discourse, which is so eminently suited to oral reading, is about the poorest sort of material for silent-reading class drill. Here is a part of one of the stories, with much of the direct discourse left out or changed to narrative:

RED HEN AND THE FOX

I

Red Hen lived in a little red house.
Near the house lived Sly Fox.
His mother lived with him.
One day Mother Fox said, "I want a hen to eat."

II

"Very well, mother," said Sly Fox, "I will get one for you."
He told his mother to get a pot of hot water ready.
Then Sly Fox took a bag and went to Red Hen's house.

III

Red Hen was in the garden.
She saw Sly Fox.
Red Hen flew up on her little house.
She thought she would be safe there.
A fox cannot fly.

IV

When Sly Fox saw Red Hen on the house, he said,
"I'll get her now."
So he ran round and round and round the house.
It made Red Hen so dizzy that she fell off the house.
Sly Fox put her in his bag and away he ran.

One Way of Using Such Material

Now, we vary the class drill on such reading material in three ways. One way is to give the whole class a definite length of time to read a certain amount of material and then to have one of the pupils tell in his own words what he has just read. Meanwhile the rest listen with books closed and watch for errors or omissions. These they are permitted to supply, after the reciting pupil has told all he can remember. To illustrate, let us suppose the teacher is going to give the class a minute in which to read section 1 of the above story. Everybody keeps his book closed, with a finger marking the place, until the teacher gives the word to begin. At the end of a minute, she says "Stop," and the books are instantly closed. John, called upon to recite, reproduces the following ideas from the story:

"Red Hen lived in a little house. A fox and his mother lived in another house near by. One day his mother said, 'I want a hen.'"

When he has finished, the teacher calls for volunteers to supply omitted facts or to correct errors of statement. In this way the following omissions and corrections may be noted:

1. The *kind* of a little house in which Red Hen lived.
2. The *name* of the fox.
3. *Why* the mother fox wanted a hen.
4. The story does not say that the foxes lived in a house. John's statement to the effect that they lived in a house shows that he did not fully understand what he read and is evidence of somewhat careless reading.

There are at least two advantages of this method of class drill in silent reading:

(1) Everybody is working all the time. Each pupil reads

(*a*) with concentration because he may be the one called upon to recite, and (*b*) rapidly because his time is limited. Concentration of attention is conducive to accurate comprehension, and speed and accuracy of comprehension are the two chief factors in efficient silent reading. (2) The pupil reciting gets practice in thinking on his feet and in expressing his thoughts orally, thus affording most of the benefits of oral reading with few of its defects.

A possible defect of the plan is that a good verbal memory may simulate real comprehension in reproducing what has been read. However, I believe psychologists concede that ability to summarize in their proper relations the main facts of a story or other selection in one's own words is a fair indication that the subject-matter is understood. But the pupil who tries to keep too closely to the words and expressions of the book in his oral reproductions can be justly suspected of lack of understanding.

The time limit and the amount of material assigned for each reading should vary with the average ability of the class and the type of matter to be read. The length of time should be so adjusted to the amount of material that the majority of the children will be forced to read at top speed in order to cover the assignment within the period. Comprehension will suffer at first, but in no other way can normal speed be developed within a reasonable length of time. Under such conditions pupils who have already formed bad habits of lip-movement or of spelling out words will be forced to abandon them in order to keep up with the others.

The time allowed for reading an assignment should not be so long as to prevent a considerable number of children from having an opportunity to recite during each class period. If the time for each assignment is three minutes and the reading period fifteen minutes, not more than three

or four pupils can recite during a period. On the other hand, if the time limit is one minute, eight or nine children will get a chance to recite. A time limit of from half a minute to a minute for all grades, the amount of material to be read being adjusted accordingly, will produce excellent results as the records of our schools prove.

The assignment should not be so long as to preclude the possibility of fairly complete reproduction of details from memory; nor should it be so short as to make possible the verbatim memorization of the words of the book in the time allowed for the reading.

A Second Method

A second way of treating the same material is for the teacher to prepare beforehand a list of questions based or the text to be read. After the pupils have read a section, timed as before, she may test their comprehension of the thought by asking the question the answers to which are given or suggested in the section read. Let me repeat here the four sections of our selection with appropriate questions on each.

RED HEN AND THE FOX

I

Red Hen lived in a little red house. Near the house lived Sly Fox. His mother lived with him. One day Mother Fox said, "I want a hen to eat."

1. In what kind of a little house did Red Hen live?
2. Who lived near them?
3. Who lived with Sly Fox?
4. What did Mother Fox say she wanted?
5. What did she want it for?

II

"Very well, mother," said Sly Fox, "I will get one for you." So Sly Fox told his mother to get ready a pot of hot water. Then he took a bag and went to Red Hen's house.

1. What did Sly Fox tell his mother he would do?
2. What did he tell his mother to do?
3. Then where did he go?
4. What did he take with him?
5. What do you suppose the pot of hot water was for?
6. What do you suppose the bag was for?

III

Red Hen was in her garden. She saw Sly Fox. Red Hen flew up on her little house. She thought she would be safe there. A fox cannot fly.

1. Where was Red Hen?
2. What did she do when she saw the fox?
3. Why did she do it?
4. Why did she think she would be safe there?

IV

When Sly Fox saw Red Hen on the house, he said, "I'll get you now." So he ran round and round and round the house. It made Red Hen so dizzy that she fell off the house. Sly Fox put her into his bag and away he ran.

1. What did Sly Fox say when he saw Red Hen on the house?
2. What did he do?
3. What happened to Red Hen?
4. What did Sly Fox do with her?

A Third Method

According to a third variation in method, the teacher may prepare questions as just shown, but, instead of having the class read a section beforehand and then asking the pupils to answer the questions from memory, she may ask the

questions one at a time and let them read to find the answers. The game is to see who can find the answer first. This practice has some advantages over the others in that it (*a*) ensures better concentration, and (*b*) soon develops the ability to scan quickly a paragraph or a page in search of a definite idea while ignoring unessential details. Such ability is very useful later in studying lessons from topical outlines. It is really a treat to see the little tots concentrating on their work, each one trembling with eagerness to be the first to discover the right idea.

Second Readers Begin in the Last Half of the First Year

Now let us return for a moment to the before-mentioned lack of suitable book material for silent-reading class drill in the first grade. Little of such material is found in present-day primers and first readers. All these books were designed for oral-reading drill. Not until we come to the second readers do we find any considerable amount of material of a usable nature and here the vocabulary requirements are rather heavy. Nevertheless, we have been obliged to use them during the last part of the first year because they are, for the most part, the only suitable books available. Their use has been possible only because the vocabulary-building and sentence-interpretation drill above described really develop reading ability with surprising rapidity when properly handled. By the end of the first half-year of such drill, most of the first-year pupils in the schools where the plan has been intelligently carried out can do very well at reading simple stories at sight.

By continuing these drills, using the new words in the reading books for vocabulary-building, the action sentences made up from these words for sentence-interpretation, we were able to begin with second readers soon after the

middle of the first year in the schools that had been under capable instruction. And these schools were not taught by highly trained and broadly experienced teachers. The good results were accomplished through interest, industry, and common sense. Of course, all the new words in each story had to be thoroughly taught before the story could be used for silent-reading drill.

The Result in One School

The results in some schools are astonishingly good. I visited one school just recently and witnessed a silent-reading drill that almost took my breath away. A second grade, of nine pupils, none of them more than eight and a half years old, was reading a simplified version of *Robinson Crusoe* by the timed-section method described above. The text was of a degree of difficulty usually assigned to the fourth or fifth grade. The teacher informed me that they had just finished reading some stories from the *Arabian Nights* a few days before. These pupils were reading a full page of the text in half a minute and then getting up and telling what they had read, scarcely omitting a detail of any importance. They not only told it, but they told it smoothly in their own words with good expression and using good English. They could certainly talk on their feet without hesitation or embarrassment. Nor was this a spectacular exhibition by very bright pupils. I looked up their mental test records on the spot. While it is true that there was none with an intelligence quotient below 90, there were only two with intelligence quotients above 110. These two had intelligence quotients of 116 and 119 respectively. The class was just an average group of children who had been under the right kind of reading instruction from the first. They were shining examples of what is possible in the way of teaching reading.

The Kind of Material Needed for First-Grade Use

To begin with, it would be a great help to have some books to replace the ordinary primers and first readers — books containing the usual children's classics written in pure narrative form without direct discourse. To illustrate, I will reproduce here a story as it is found in a popular first reader, and then give the same story in rewritten form suitable for silent-reading drill, or at least as nearly suitable as purely literary narrative can be.

I

THE THREE LITTLE PIGS

Once there was a mother pig.
The mother pig had three little pigs.
There was little pig One.
There was little pig Two.
There was little pig Three.
One day the mother pig said,
"Go, find some work, little pigs."
The little pigs went to find work.

Little pig One said, "I shall build me a house."
Little pig Two said, "I shall build me a house."
Little pig Three said, "I shall build me a house."

Little pig One said,
"I shall build a soft house."

Little pig Two said,
"I shall build a tall house."

Little pig Three said,
"I shall build a strong house."

One day little pig One found some straw.
The straw was soft.

Little pig One said,
"This straw will make my house soft.
I will build a straw house."
Then little pig One built a house of the soft straw.

One day a wolf came to the straw house.
The wolf knocked at the door.
The little pig ran to the door.
The wolf said:

"Little pig, little pig,
Let me come in."

"No, no, by the hair
Of my chinny-chin-chin."

"Then I'll huff and I'll puff
And I'll blow your house in."

Then the wolf huffed and puffed and blew in the straw house and ate up the little pig.

Little pig Two found some sticks.
Little pig Two said,
"The sticks will not make a strong house.
The sticks will make a tall house.
I will build my house of sticks."
Then little pig Two built a tall house of sticks.

One day the wolf came to the house of sticks.
The wolf knocked at the door and said,
"Little pig, little pig," etc.

So the wolf huffed and puffed and blew in the house of sticks and ate up little pig Two.

Little pig Three found some stone.
Little pig Three said,
"This stone will make a strong house;
I will build my house of stone."

The little pig worked one day.
He worked two days.
He worked three days.
Then the house of stone was built.

The wolf came to the stone house.
He knocked at the door.

WOLF. Little pig, little pig,
Let me come in.

PIG. No, no, by the hair
Of my chinny-chin-chin.

WOLF. Then I'll huff and I'll puff
And I'll blow your house in.

PIG. You may huff and puff, but you will not
blow my house in.

The wolf huffed and puffed and puffed and huffed, but he did not blow in the strong house of stone.

The same story in the following form, with much of the direct discourse and with all needless and monotonous repetition omitted, is much more suitable for silent reading class drill.

THE THREE LITTLE PIGS

I

Once there was a mother pig with three little pigs. The pigs were named One, Two, and Three. One day the mother pig told them to go find some work. So the little pigs went to find work.

II

Each little pig said he would build himself a house. Little pig One said he would build himself a soft house. Little pig Two said he would build himself a tall house. Little pig Three said he would build himself a strong house.

III

One day little pig One found some straw. The straw was soft. It would make a soft house. So little pig One built a house of the soft straw.

IV

One day a wolf came to the straw house. The wolf knocked at the door. The little pig ran to the door. The wolf said:

"Little pig, little pig, let me come in."

"No, no, by the hair of my chinny-chin-chin."

"Then I'll huff and I'll puff and I'll blow your house in."

Then the wolf huffed and puffed and blew in the straw house and ate up the little pig.

V

Little pig Two found some sticks. Sticks will not make a strong house. They will make a tall house. So little pig Two built a tall house of sticks.

VI

One day the wolf came to the house of sticks. He knocked at the door and said:

"Little pig, little pig," etc.

So the wolf huffed and puffed and blew in the house of sticks and ate up little pig Two.

VII

Little pig Three found some stones. Stones will not make a soft house but they will make a strong one. So little pig Three built his house of stones. He worked three days and then the house of stone was built.

VIII

The wolf came to the stone house. He knocked at the door.

"Little pig, little pig," etc.

The wolf huffed and puffed and puffed and huffed but he did not blow in the strong house of stone.

If such stories could be printed with four or five good questions immediately following each section, so much the better. The teacher would then be furnished with test questions which she might not have the ambition to prepare beforehand for herself. If the teacher makes up her questions in class, much time is usually wasted and the questions are not well chosen. All new words in each story should be printed at the beginning of the story.

Do not fear for an instant that the use of such metamorphosed (desiccated, if you will) stories of childhood will result in less interest and enthusiasm on the part of pupils. What is lost in the material is made up in the method. I have never seen anywhere else such spontaneous enthusiasm as is evidenced by our silent-reading classes, providing the drill is properly handled and the teacher herself shows some life and interest. And without an interested and enthusiastic teacher, neither material nor method of any sort will arouse any great enthusiasm in class drill. Several times have pupils complained to me that their teachers were not carrying on the reading drill as I had directed and demonstrated in the presence of the children. They asked me to try to have her do so, because they thought the work, as I presented it, was so much more interesting. These complainants were not first-grade pupils, of course.

Still better would be some books based on historical and geographical facts and written as pure exposition. Expository material is best suited to silent-reading drill. Only very elementary facts should be so treated, and that in the simplest possible language. With the use of such books the intensive study inherent in properly conducted silent-reading drill would make the reading period doubly valuable because the children would be acquiring worthwhile information while, at the same time, developing reading ability.

But even better types of silent-reading exercises are possible, especially for the transition from the quick-perception word and sentence drills to book material. Books filled largely with the type of exercises used in Haggerty's "reading test" for primary grades would be excellent to replace the ordinary primer for silent-reading purposes. Some of this material is reproduced below.[1]

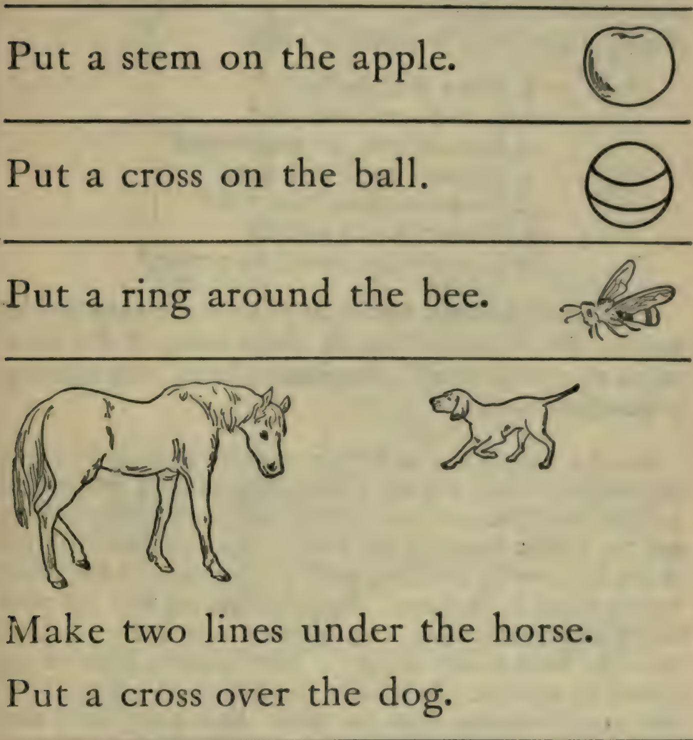

Fig. 14

[1] From *Haggerty Reading Examination:* Sigma 1. Copyright, 1921, by World Book Company, Yonkers-on-Hudson, N.Y.

Such exercises as these could be varied with action sentences like those heretofore suggested, the child proving his understanding of the sentences by carrying out the actions therein described. Such action sentences should gradually increase in length and difficulty throughout the book

Questions like the following also make good elementary silent-reading exercises. Here the child reads the question silently and gives his answer orally:

1. Can a chair walk?
2. Is four more than two?
3. Have all girls the same name?
4. Are men larger than boys?
5. Does flour come from milk?
6. Is every man a soldier?
7. Does the sun rise in the evening?

Other good material would be pictures accompanied by descriptions or little stories in which many of the statements do not agree with the pictured facts. My meaning is illustrated below.[1]

One day when Betty and Harry were playing barefooted in the fields with their dog and kittens, they found a mother bird teaching her little ones to fly. This picture shows the children and the kittens watching the birds. The four little birds are sitting in a row on the fence while the frightened mother bird flutters about below them. Both children are very still so as not to frighten the birds. Harry has a hoop in his left hand. His right hand is out of sight. Betty's hat is lying on the ground by her feet. In front of the kittens are two tall lilies. How many blossoms have the lilies? How many buds have they? What is the dog doing?

[1] The illustration is from the *Primer*, in the series of *Riverside Readers* (Houghton Mifflin Company). In the original the picture is in two colors. As reproduced here it is reduced one-fourth in size.

FIG. 15

The pupils read the description or story, compare its statements with the facts of the picture, and point out errors. Of course the misstatements cannot be indicated by the pupils unless they understand the printed thoughts.

These are only a few suggestions of the possibilities for effective devices to further the efficiency of silent-reading drill in the first grade.

Reading in the Second Grade

During the year in which our new reading program was initiated, we were confronted with almost as many difficulties in teaching silent reading in the second grade as we encountered in the first grade. True, the children averaged about a year older and could read a little orally. That is, they had learned to recognize a considerable number of printed words and to pronounce them correctly. But in silent-reading work they were almost as helpless as the beginners. In some respects they were even worse off than the beginners. They had already formed many bad reading habits. Lip-movement was universal when they were asked to read silently. Most of them had been taught the alphabet as the first step in learning to read, and their first reading drills were like this, each pupil in turn standing at the teacher's knee while she pointed out the words for him one at a time.

S-e-e, see; t-h-e, the; c-a-t, cat.
H-e, he; i-s, is; a; g-o-o-d, good; c-a-t, cat.
S-e-e, see; t-h-e, the; g-o-o-d, good; c-a-t, cat; r-u-n, run.

As a consequence these pupils had formed the habit of spelling each word before they could pronounce it. It was a painful sight to watch them trying to read to themselves at their seats, spelling out each word letter by letter and then pronouncing them in audible whispers as they progressed with the end of their forefinger slowly through the short, simple sentences in a first reader. The teaching of whole words and sentences by quick-perception methods, so far as I could ascertain, had been entirely unknown in the schools of the district.

These bad reading habits, formed through improper instruction and drill without due regard to the correct order of associations which I have mentioned, more than offset what little oral-reading ability the children had acquired their first year in school. Such habits had to be broken up before correct ones could be formed. Therefore we were obliged to use practically the same methods and materials in the second grade as in the first grade during the first year of silent-reading work.

But the next year, with second grades made up mostly of pupils who had been under proper reading instruction from the first, the problem was much simplified. There were few normal pupils who were unable to read rapidly and with comprehension material of the grade of difficulty found in ordinary second readers. Accordingly, there was no lack of reading matter for the work in this grade. Second and third readers were used as the chief sources of material, the latter during the last half of the year. Eight to ten books were read in class during the year by the same methods outlined for the first grade. All class reading was done at sight. Pupils were not permitted to have their class reading books at their seats. Vocabulary-building and sentence-interpretation drills were carried on throughout the year in much the same manner as described for the first grade. All new words in each story were thus thoroughly drilled upon before the story itself was attempted.

Pronunciation of new words was still repressed during the greater part of the year. But with the opening of the spring term oral-reading practice was begun because of the insistent demands of the teachers who feared that the children would never learn to read orally if they were confined too long and too exclusively to the silent-reading drill. The oral reading was begun in primers. Much to

the surprise of some of the teachers, most of the pupils could read very well indeed and could pronounce nearly every word correctly. In fact, the primer material proved so easy for them that they were given first readers after a few days, and it was found that they could read nearly as well from them as from the primers. By the middle of the term they were doing good work in second readers. Throughout the spring term from a third to a half of the reading time was devoted to practice in oral reading. By the end of the year the majority of the second-grade pupils could read fluently from the easier third readers. In the June tests more than fifty per cent of them tested third grade or better in silent-reading ability; and at the same time they could read orally more smoothly and with better expression than could many in the fourth and fifth grades.

The most surprising thing about this sudden introduction to oral reading was the ability of the pupils to pronounce most of the words correctly, although, for the most part, they had been rigidly restrained from pronouncing them while they were being learned in class. Yet there was really nothing to be wondered at. Even to beginners most of the words contained in the lower-grade readers are familiar in their vocal forms and usually also in their meanings. The pupils had had nearly two years of intensive drill in the direct association of words with their meanings, so that when they saw a printed word it was instantly associated with its meaning and the next instant with its vocal form with which they were already familiar before they ever tried to read. Most of the hesitation and stumbling by the pupil in oral reading is due to the fact that he does not know the meanings of the "hard" words and is trying to recall imperfectly formed associations between meaningless visual forms and their respective vocal forms. For instance, a child comes to the word "stove"

in his reading. He does not connect it in his mind with any vocal form or with any familiar object. In other words, the word has no meaning for him. He hesitates, stumbles over it, and guesses at it. Then the teacher pronounces it for him and he reads on. The next day the teacher pronounces it for him again. After several such pronunciations by the teacher, he may make permanent association between the printed and spoken forms of the word.

Now, if the first time the word was met with, the teacher had pointed out a stove or shown the child a picture of one, he could instantly have pronounced the word without the slightest trouble. It was not the pronunciation of the word that needed to be taught, but its meaning as associated with its visual form. Hence these second-grade children, with very little or no previous practice in oral reading, could read well orally because they had learned to associate the printed words directly with the ideas which they represent. The spoken names of the ideas had been already acquired when they learned to talk, so that the vocal forms came spontaneously as fast as they recognized the meaning of the printed words. With such a foundation of vocabulary knowledge to build upon, oral-reading ability developed very rapidly with practice.

And since, with children so trained, understanding precedes oral expression, they put intelligent expression into their reading almost as naturally as they do into their speaking. There was absolutely no doubt but that at the end of the year they were able to read orally as well as or better than most second-grade pupils. Their silent-reading ability has already been noted. So there seems to have been nothing lost and much gained by postponing oral reading until the latter part of the second year. It is quite probable that nothing would have been lost if oral reading had been postponed until the last half of the third year.

At any rate, the fears of the teachers that the children would not learn to read orally having been mostly allayed by this experience, our next class will not begin oral reading until the third year.

Considerable unsupervised silent reading was done at the seats during the second year. The children fairly reveled in the stories and pictures in the primers and first readers which by this time most of them could read with ease. They read them over and over at their seats. Nearly every day some of them were permitted to tell to teacher and classmates some story thus read. The ten to twelve new sets of primers and first readers in each school furnished ample material for seat work in silent reading.

Although of necessity the literary contents of second and third readers furnished most of the drill material in this grade, nevertheless, we were not wholly confined to them. Some informational matter was simple enough to be available. For instance, toward the end of the year it was found possible to utilize to good advantage the James Otis Colonial Series of historical readers in some of the schools. Among the titles of this series are *Mary of Plymouth* and *Ruth of Boston*. In these books colonial life is pictured as the background for imaginary biographies of typical boys and girls of the colonial period. Carpenter's *Around the World with the Children* is another book with real content value that is simple enough for use in this grade. Most of the material available for second grade is, however, of the purely literary type which, as has been said, is least suitable and least valuable for silent-reading class drill. The lack of simple, accurate informational reading matter is felt almost as strongly in the second grade as in the first.

Reading in the Third Grade

With the beginning of the third year, our difficulties in the way of teaching silent reading rapidly diminish. With

independent reading ability already acquired through two years of intensive silent-reading drill and vocabulary-building, it is mostly a matter of more practice and more vocabulary-building with the advantage of a much wider range of reading material which can be adapted to class drill by the wide-awake and industrious teacher.

The same sort of vocabulary-building drill through the use of quick-perception cards, with the meanings of new words explained by means of objects, pictures, or illustrative actions, should be continued through at least a part of this year. The many new words found in the supplementary reading books available for this grade, especially those of informational content, offer ample material for vocabulary-building. There are a great many words used in historical, geographical, and nature readers that are not usually found in the literary readers. If the more common of these words are made a permanent part of the child's reading vocabulary at this time, he will be that much better equipped to do good work in history and geography later on. A large part of the difficulty experienced by pupils in learning their lessons in the content subjects is due to the fact that they do not know the meanings of words. In fact poor reading and ineffective study is largely due to lack of word knowledge on the part of the reader. Hence my insistence on a type of vocabulary-building drill that will give the child as early as possible a large stock of words properly and permanently associated with their respective meanings.

There are a large number of books now on the market which treat of historical and geographical facts in an interesting manner and which are not too difficult for third-year classes. More are appearing every year in response to the rapidly increasing demands for supplementary reading of this nature.

Oral reading is not neglected in the third grade, but it is mostly intensive rather than extensive. Its chief purpose is conceived to be the development of habits of clear enunciation and articulation. I would rather have a pupil read one paragraph well with every word pronounced clearly and distinctly than to have him read a whole story carelessly, slurring and clipping his words. We must remember that "oral reading" is really practice in speaking and that, unless oral-reading drill leads (or drives) the pupil to form good habits of speech, it is time largely wasted.

I know full well that throughout this discussion I have been flying in the face of well-established customs and traditions pertaining to reading aims and reading methods and in the face of some quite recently accepted conclusions in regard to the teaching of reading. But this is not an exposition of theory, so much as it is a narration of actual experience. Changes of method in the teaching of reading were suggested and shown to be necessary by the results of the first silent-reading tests. The changes made and herein described are based mainly on two things: (1) The aim to develop efficient readers in the shortest possible time, and (2) the generally accepted psychological principles of association and memory set forth in this and preceding chapters.

We have found our methods good. We have proved, to our own satisfaction at least, that they will produce results in actual practice. We are doing what we set out to do, that is, we are developing in three or four years reading ability as good as or better than the ability ordinarily developed in the same schools in five or six years. We may, of course, be losing some things of value which are derived from other methods; but we are at least getting as a recompense real reading efficiency in most of our schools.

CHAPTER XIII

READING IN THE UPPER GRADES

Reading as a Separate Subject should not be Necessary in the Upper Grades

During the first year of the new régime upper-grade reading presented some problems all its own. It should not have been necessary to teach reading as a separate subject above the third grade; and probably it would not have been necessary, if during the first three years the children had been given efficient instruction and drill. In general it may be said that if, by the end of the third year, the mechanics of reading have been acquired to the extent that they may be, all that the pupil ought to need thereafter is continuous practice on material of increasing difficulty; and that practice can be arranged for (*a*) in connection with other subjects and (*b*) by much assigned silent-reading work to be done at seat or at home. Extensive silent reading done at home or at seat will undoubtedly help to improve reading ability through practice. This procedure, however, is far too slow and unreliable. Intensive drill in silent reading should undoubtedly continue throughout the grades. If such drill is not given in connection with other subjects, then it should surely be given a place of its own in the program. The fact that efficient reading practice *can* be given in connection with other subjects is no guarantee that it *will* be so given unless definite arrangements are made for it. It has been my experience that any line of work not specifically provided for in the daily schedule, with a time allotment of its own, is pretty sure to be neglected unless it happens to be a hobby of the teacher.

Local Conditions Required Vigorous Action

At any rate, in our situation if existing conditions were to be remedied to any appreciable extent by the end of the year, it was necessary to provide for much systematic and intensive drill in reading for the upper grades. Pupils old enough for the third and fourth grade were unable to read as well as beginning-second-grade pupils ought to be able to read. More than half the pupils in the other grades were from two to four grades below normal. Strong remedial measures were therefore essential if the schools were to be brought up to the test standards within a reasonable length of time.

The Plan

Accordingly, it was decided to have special reading classes for the upper grades. For this purpose the upper-grade pupils in each school were divided into two groups. In general the pupils of the fourth and fifth grades formed one group and those of the sixth, seventh, and eighth grades made up the other. In some schools it was found necessary to include the sixth grade in the lower group. In most schools the best readers of the fifth grade worked with the higher group, while the poorest readers of the higher grades worked with the lower group. In this way two groups of fairly uniform reading ability were secured, so that separate reading classes for each grade were unnecessary. Then, partly by cutting down the disproportionately large amount of time customarily devoted to arithmetic and partly by utilizing to a large extent the subject-matter and supplementary reading of other subjects for our silent-reading material, we managed to squeeze out of our congested eight-grade, one-teacher program, two fifteen-minute reading periods per day for

each of these groups. This is of course double the amount of time that ordinarily need be devoted to special reading drill in these grades.

And this was not all. Much of the class work in geography and history was so conducted as to furnish the best kind of silent-reading drill, so that all told the upper grades had from forty-five minutes to an hour of intensive reading drill nearly every day. In our case the importance of the subject and the existing low level of efficiency demanded that strenuous measures be taken.

That these measures were effective is proved by the fact that at the end of the same year nearly ninety per cent of all mentally normal pupils had attained to grade standards. Most of those who were not up to standard in the June tests were pupils in the three or four schools where the plan was not efficiently carried out because of lack of interest or adaptability on the part of the teachers.

After considerable experimenting our special reading schedule for the upper grades evolved into something like this:

SILENT-READING SCHEDULE FOR UPPER GRADES

		Mon.	*Tues.*	*Wed.*	*Thurs.*	*Fri.*
Grades 4 & 5	A.M.	History	Phys.&Hyg.	Geog.	Civics	Manners and Conduct
	P.M.	Literature	Geog.	History	Literature	Current Events
Grades 6, 7 & 8	A.M.	History	Phys.&Hyg.	Geog.	Civics	Manners and Conduct
	P.M.	Literature	Geog.	Civics	History	Current Events

Character of the Reading Material

The types of reading material used in carrying out this schedule were principally as follows:

History. In the upper grades, besides regular American history texts, we used books like Tappan's *Our European Ancestors*, *England's Story*, *Story of the Greek People*, *Story of the Roman People*, Guerber's *Story of the Chosen People*, Coe's *Makers of the Nation*, etc. For silent-reading material in history for the fourth and fifth grades we used various books of American and Old-World hero stories, myths, and fables. No other class work in history was done in these grades.

In all grades the customary question-and-answer recitation was entirely replaced by this silent-reading work reviewed by fortnightly oral or written tests on the subject-matter covered during the preceding two weeks. The time usually devoted to seat study of history was given over to reading other of the many books of myths and hero tales, stories of pioneer and colonial life, and Indian legends recommended for supplementary reading in history, especially in the fourth, fifth, and sixth grades.

Geography. The geographical reading material consisted for the most part of one of the several excellent series of geographical supplementary readers now published. The very complete lists of well-chosen review questions given in some of these books make them particularly well adapted to the type of silent-reading drill wherein the teacher asks questions while the children read to find the answers. This method was described in chapter XII.

Physiology and Hygiene. Books of the Woods Hutchinson Health Series and Ritchie's *Primers of Physiology*, *Hygiene*, and *Sanitation*, were used. Silent-reading drill from these books together with occasional discussion and

periodical tests by way of review, comprised all the book work given in physiology and hygiene. A part of the work was seat work, the children being assigned a topic with a list of questions to cover it and being required to find and write the answers to the questions.

Civics. Modern texts emphasizing community civics were used for silent-reading class drill and supplemented by discussions of local community problems. This covered all the work required in the line of civics.

Literature. Reading material for these periods was taken from whatever suitable books were available in the different schools. The reading was done orally with particular attention to securing as far as possible a real audience situation for the reader. The book in the hands of the reader was the only one used in the class. The rest of the class, with the teacher, made up the audience.

According to this method the pupil who does the reading stands in front of, and facing, the class; and after reading about a page he takes his seat. Then the teacher calls upon some member of the class to tell in his own words the part of the story just read. Then another pupil is called upon to go on with the reading. Since neither teacher nor classmates have any books to look at and must therefore depend entirely on the reader for the author's thoughts, the reader has every incentive to do his best. The device of calling upon another pupil to reproduce what has been read tests that pupil's understanding of the passage, ensures the attention of the whole class to what is being read, since none of them know which one is going to be called upon to recite, and tends to develop a habit of giving strict attention to the words of a reader or a speaker — a thing of no little importance in itself.

Manners and conduct. McVenn's *Good Manners and Right Conduct* was read either silently or orally. Discus-

sions were held only when the pupils themselves wished to "start something." The danger of mere discussion by the teacher lies in making the "morals" of the stories too obvious.

Current events. This consisted of oral reading in class of interesting and informational (not merely sensational or funny) items from the news of the day.

The Books Mentioned are Merely Suggestive

The particular titles mentioned on the foregoing pages are not listed as being those of the best books available for silent-reading purposes, but are merely suggestive, of the types of books now available that are best suited and most valuable for the kind of intensive silent-reading drill that will develop habits of efficient study. Until we have *real* silent-reading textbooks, with material properly and specially organized to aid in developing the several phases of silent-reading ability, we cannot do better than utilize for our purposes good textbooks and supplementary readers rich in content value. Such books as the various geographical, industrial, nature, and science readers, together with regular textbooks in the content subjects, represent the very best all-around silent-reading material yet available.

By the use of such books we are killing at least three birds with one stone. We are getting our supplementary reading done in such a way that the children will derive some benefit from it; we are developing the most valuable kind of reading ability; and we are supplying the children with a broad range of valuable information. Moreover, that information is presented to them under just the psychological conditions that make for retention. The concentration forced upon the pupil by the right kind of silent-reading drill is the best guarantee that the material read will be remembered as well as understood.

Why Literature is not Adapted for Silent-Reading Drill

This suggests one of the principal reasons why literature does not furnish the best kind of drill material. It is not only difficult to test the pupil's comprehension of material which has been read silently; but it is also inappropriate to devote to such material the intensive study inherent in properly conducted silent-reading drill. The chief aim in the reading of literature is appreciation, not the development of reading ability, and the intensive drill and thorough testing for comprehension connected with silent-reading lessons is not conducive to appreciation of the literary merits of the selections read.

Probably literary appreciation can be best developed through extensive reading of good literature outside the class. Literary appreciation is something that grows upon one principally through acquaintance and constant association with good literature. I doubt if the teacher can do much toward developing it beyond furnishing an environment of good books and encouraging the children to read them on their own initiative. If she has to lead up to the habit of reading and liking good literature through getting the children at first to read something that is not so good, she should not be discouraged nor shrink from the process. The first thing is to give the children the ability to read easily and understandingly. The next thing is to get them to read willingly almost anything that is not positively harmful. What if their tastes do incline at first toward "blood and thunder," crude humor, or cheap sentimentalism? If you can once get them into the reading habit, you may be able to lead them to something better; but if you cannot get them to read at all except under compulsion, you stand little chance of developing much literary appreciation in them.

Certainly it cannot be developed through the medium of the microscopical dissecting exercises usually considered essential to the teaching of literature for appreciation. Here is a chance for the anti-vivisectionists to function for the good of society in general and suffering school children in particular — that is, in connection with the murderous and cruel dissecting, under the hands of misguided teachers, of the living, throbbing, emotional gems of English literature.

Some who read this book will probably criticize the idea of a reading program and a reading method so bare of opportunities to develop appreciation of good literature. But remember my aim is not to develop literary appreciation, but to develop reading ability. Literary appreciation has no necessary connection with such an aim. The only connection there is between literary appreciation and reading ability is that the former is almost entirely dependent on the latter. Therefore the sooner the latter is acquired, the sooner can the former become a possibility. Let me repeat. The study of literature has no necessary connection with the development of reading ability. It is beginning to be evident that it has no profitable connection with it from the point of view of reading efficiency. Hence, if literary material is not suitable for use in developing the kind of reading ability that we want to develop (and must develop, if our schools are to be truly efficient), then let us relegate such material to its proper place, namely, the study of *literature*, while we go ahead and teach *reading* with the best type of material we can find for the purpose.

The Kind of Material Needed for Silent Reading

For the upper grades as well as for the lower grades we are greatly in need of books with informational content especially organized and arranged into silent-reading exercises

and accompanied by teachers' manuals giving explicit instructions for the treatment of each lesson. I know of but two attempts so far to produce books specially designed to aid in the development of real silent-reading ability. These attempts have resulted in the placing of two sets of "Silent Readers" on the market within the past year. The Bolenius Readers are well designed and go far toward filling the great need of material properly arranged for silent-reading class drill. It would be difficult to improve upon them as mediums of development of certain phases of silent-reading ability or in their mode of presenting narrative material for silent-reading purposes. But they do not sufficiently present the type of reading material which the pupils meet in studying their daily lessons in history, geography, physiology, civics, etc. The special vocabularies of these studies contain great numbers of words not found in ordinary narrative material. Hence the Bolenius Readers need to be supplemented by class reading drill in material similar to that found in the content subjects of the elementary school.

The other series of readers, besides containing a preponderance of narrative material, is scarcely more adapted to silent-reading class drill than is the ordinary literary reader since only a few of the selections are accompanied by adequate and specific instructions or devices for testing comprehension. Scattered throughout each book, however, are a few exercises of real value; but most of them are designed for seat work, rather than for class drill.

Some examples of good selections for silent reading are reproduced below:

EXERCISE I

(Material selected from Tappan's *Diggers in the Earth*, and arranged for intensive study, paragraph by paragraph. The first number at the end of each paragraph or section is the

number of words in the section. The number in parentheses is the total number of words in the exercise up to the end of that particular paragraph.)

Directions: Let the class read the first question under section I. Then see who in the class can find the answer first. Then take the second question, and so on. The whole exercise can be assigned as seat work, but in that case a time limit should be assigned. As seat work the answers to the questions should be written out and passed in by the pupils or rapidly corrected in class.

AT THE GOLD DIGGINGS

Section I

When gold was first discovered in California, in 1848, people from all over the world made a frantic rush to get there, every one of them hoping that he would be lucky enough to make his fortune, and fearing lest the precious metal should be gone before he could even begin to dig. The gold that these men gathered came from what were called "placers"; that is, masses of gravel and sand along the beds of mountain streams. Each miner had a pan of tin or iron, which he filled half full of the gravel, or "pay dirt," as the miners called it. Then, holding it under water, he shook off the mud and stones over the side of the pan, leaving grains of gold mixed with black sand at the bottom. This black sand was iron, and after a while the miners removed it with a magnet, dried what remained, and blew away the dust, leaving only the grains of gold.

162

1. What happened in 1848?
2. Why did so many people rush to California when they heard the news?
3. Why were they in such a hurry to get there?
4. What are "placers"?
5. What is "pay dirt"?
6. How did the miners separate the gold from the gravel?
7. What was left in the pan besides gold?
8. How did they get rid of the iron?
9. How did they get rid of the dust?

Section II

Another contrivance which soon came into use was the "cradle." This was a long box, sometimes only a hollowed-out log. At the top was a sieve which sifted out the stones. Nailed to the bottom of the cradle were small cleats of wood, or "riffles," which kept the water from running so fast as to sweep the gold out of the cradle with it. The cradle was placed on rockers and also tilted slightly. The miner shoveled the gravel into the top of the cradle and his partner rocked it. The sieve kept back the stones, the water broke up the lumps of earth and gravel and washed them down the cradle, and the grains of gold were stopped by the riffles, and sank to the bottom. Sometimes the "pay dirt" continued under a stream. To get at it, the miners often built a little canal and turned the water into a new channel; then they could work on the former bed of the river.

166 (328)

1. What was the miner's "cradle"?
2. What were the riffles and what were they for?
3. Explain how the gold was separated from the gravel by means of a cradle?
4. When the streak of pay dirt extended under a stream how did the miners get at it?

Section III

Before many years had passed the gold that was near the surface had been gathered. The miners then followed the streams up into the mountains, and found that much of the gold had come from beds where in ancient times rivers had flowed. There was gold still remaining in these beds, but it was poorly distributed, the miners thought. Sometimes there would be quite an amount in one place, and then the miner would dig for days without finding any more. Even worse than this was the fact that these gravel beds were not on the top of the ground, but were covered up with soil and trees. Evidently the slow work with pans and cradles would not pay here; but it occurred to some one that if a powerful stream

of water could be directed against the great banks of earth, as water is directed against a burning building, they would crumble, the dirt could be washed down sluices, and the gold be saved. This was done. Great reservoirs were built high up in the mountains, and water was brought by means of ditches and pipes to a convenient place. Then it was allowed to rush furiously through a hose and nozzle, and the great stream coming with tremendous force was played upon the banks of gravel. The banks crumbled, the gravel was washed into a string of sluices, or long boxes with riffles to catch the gold. Soon the miners found that if quicksilver was put into these sluices, it would unite with the gold and form a sort of paste called "amalgam." Then if this amalgam was heated, the quicksilver would be driven off in the form of gas, and the gold would remain in a beautiful yellow mass.

290 (618)

1. What did the miners do when the placer gold gave out?
2. What did they find?
3. Find two reasons why the slow work with pan or cradle could not be made to pay in working these new gravel beds.
4. What plan was finally adopted for getting the gold from them?
5. How did they get the necessary water pressure?
6. What use did the miners discover for quicksilver?
7. How was the gold separated from the quicksilver?

Section IV

The ancient rivers had also carried gold to the valleys, and to collect this a dredge, which the miners called a "gold ship," came into use. The "ship" part of this machine is an immense flat scow. Stretching out from one end is something which looks like a moving ladder. This is the support of an endless chain of buckets, each of which can bite into the gravel and take a mouthful of five or six hundred pounds. They drop this gravel into a big drum which is continually revolving. Water flows through the drum, and washes out the sand and bits of gold over large tables, where by means of riffles and quicksilver

the gold is captured. This scow was usually on dry land at first; but its digging soon made a lake, and then it floated. It must be more fascinating to hold a pan in your own hands and pick out little grains of gold or perhaps even a big piece of it with your own fingers, but if the gravel is good the dredge makes more money.

181 (799)

1. Where else had gold been carried by the rivers?
2. What is another name for the dredge used in working these valley gold deposits?
3. By what means is the gravel taken aboard the dredge?
4. What is said of the amount of gravel each bucket holds?
5. What do the buckets do with the gravel when they have brought it aboard?
6. How is the gold separated from the gravel in this method of mining?
7. Is the dredging begun on dry land or on a lake or river?
8. Then why is it necessary to have a scow?

Section V

In Alaska the great difficulty in mining is that, except at the surface, the ground is frozen all the year round. At first, the miners used to thaw the place where they wished to dig by building wood fires; but this was a slow method, and now the thawing is done by steam. They carry the steam in a pipe to the place where the digging is to be done, and send it through a hose. At the end of the hose is a pointed steel tube. They hammer this tube into the ground and let some steam pass through the nozzle. This softens the ground so that picks and shovels may be used. There is generally cold enough in Alaska, but once at least the miners had to manufacture it. The gold-bearing gravel was deep, the ground was flat, and it was often overflowed. They set up a freezing plant, and shut in their land with a bulkhead of ice several feet thick. Then they pumped out what water was already in and did their work with no more trouble.

181 (980)

1. Why is mining difficult in Alaska?
2. What was the first method of overcoming this difficulty?
3. How is it done now?
4. In what peculiar way was one mine kept from being flooded?

Section VI

When gold began to grow less in the California gravel, the miners looked for it in the rocks on the mountain-side. The placer miners laughed at them and called their shafts "coyote holes"; but in time the placers failed, while nearly all of our gold to-day comes from veins of white quartz in the rocks. A vein of gold is the most capricious thing in the world. It may be so tiny that it can hardly be seen, then widen and grow rich in gold, then suddenly come to an end. This is why a new mine is so uncertain an enterprise. The gold may hold out and bring fortunes to the investors, or it may fail, and then all they will have to show for their money is the memory that they put it into a hole in the ground. The managers of a few of the well-established mines, however, have explored so far as to make sure that there is gold enough for many years of digging.
171 (1151)

1. Where did the miners next look for gold?
2. Where does most of our gold come from at present?
3. Why is a new mine a very uncertain enterprise to invest money in?

Section VII

The mining engineer must be a very wide-awake man. It is not enough for him simply to remember what was taught him in the schools of mining; he must be bright enough to invent new ways of meeting difficulties. No two mines are alike, and he must be ready for all sorts of emergencies. A gold mine now consists of a shaft or pit dug several hundred feet down into the rock, with levels or galleries running off from it and with big openings like rooms made where the rock was dug out. The roofs of the rooms are supported by great timbers. To

break away the rock, the miner makes a hole with a rock drill worked by electricity or compressed air, puts powder or dynamite into the hole, and explodes it. The broken rock is then raised to the surface and crushed in a "stamping mill." Here the ore is fed into a great steel box called a "mortar." Five immense hammers, often weighing a thousand pounds apiece, drop down upon the ore, one after another, until it is fine enough to go through a wire screen in the front of the box. When two hundred or more of these hammers are pounding away with all their might a stamping mill is a pretty noisy place. The ore, crushed to a fine mud, now runs over sloping tables covered with copper. Sticking to the top of the copper is a film of quicksilver. This holds fast whatever gold there may be and makes an amalgam, which is scraped off from time to time, and the quicksilver is driven from the gold by heat.

276 (1427)

1. What sort of a man must a mining engineer be?
2. Why?
3. Describe a gold mine.
4. What is timber used for in a gold mine?
5. How is the gold-bearing rock broken up?
6. What is done with it after bringing it to the surface?
7. Why is a stamping mill a noisy place?
8. What is the ore like when it leaves the stamping mill?
9. How is the gold separated from it?
10. Of what use is quicksilver in the process?

Section VIII

Gold that is not united with other metals is called "free milling gold." Much of it, however, is found in combination with one metal or another, and is known as "rebellious" or "refractory" gold. Such gold may sometimes be set free by heat, and sometimes by chemicals. One way is by the use of chlorine gas, and the story of it sounds almost like "The house that Jack built." It might run somewhat like this: This is the salt that furnishes the chlorine. This is the chlorine gas that unites with the gold. This is the chloride that is formed when

the chlorine gas unites with the gold. This is the water that washes from the tank the chloride that is formed when the chlorine gas unites with the gold. This is the sulphate of iron that unites with the chlorine gas of the chloride that the water washes from the tank that is formed when the chlorine gas unites with the gold — and leaves the gold free.

168 (1595)

1. What is "free milling gold"?
2. What is "refractory" gold?
3. What are two ways of setting free refractory gold?
4. What is the chlorine obtained from?
5. What does it unite with?
6. What substance is formed when this union takes place?
7. What part does water take in the process?
8. How is the gold finally freed from the chloride?

Section IX

Another method is by the use of cyanide. More than a century ago a chemist discovered that if gold was put into water containing a little cyanide, the gold would dissolve, while quartz and any metals that might be united with the gold would settle in the tank. The water in which the gold is dissolved is now run into boxes full of shavings of zinc and is "precipitated" upon them; that is, the tiny particles of gold in the water fall upon the zinc and cling to it. Zinc melts more easily than gold, so if this gilded zinc is put into a furnace, the zinc melts and the gold is set free. Very often gold is found combined with lead or copper. It must then be melted or smelted in great furnaces. The metal is heavier than the rock and settles to the bottom of the furnace. It is then drawn off and the gold is separated from the other metals, usually by electricity.

165 (1760)

1. How can gold be dissolved in water?
2. After being dissolved, how is the gold removed from the water?
3. Then how is it separated from the zinc?

4. What two metals are very commonly found combined with gold?
5. When thus found how is the gold obtained?

Section X

Sometimes large pieces of gold called "nuggets" are found by miners. The largest one known was found in Australia. It weighed 190 pounds and was worth $42,000. Sometimes spongy lumps of gold are found; but as a general thing gold comes from the little specks scattered through veins in rock, and much work has to be done before it can be made into coins or jewelry. It is too soft for such uses unless some alloy, usually copper or silver, is mixed with it to make it harder. Sometimes it is desirable to know how much alloy has been added. The jeweler then makes a mark with the article on a peculiar kind of black stone called a "touchstone," and by the color of the golden mark he can tell fairly well how nearly pure the article is. To be more accurate he pours nitric acid upon the mark. This eats away the alloy and leaves only the gold.

159 (1919)

1. What are nuggets?
2. What was the largest one ever found?
3. How much was it worth?
4. Are large nuggets common?
5. How is gold usually found?
6. Why is pure gold not used for coins and jewelry?
7. How is it made harder?
8. How can a jeweler tell how much alloy has been added to the gold in any article made of gold?

Section XI

Gold is a wonderful metal. It is of beautiful color; it can be hammered so thin that the light will shine through it; few acids affect it, and the oxygen which eats away iron does not harm it. Pure gold is spoken of as being "twenty-four carats fine," from carat, an old weight equal to one twenty-fourth of

an ounce troy. Watchcases are from eight to eighteen carats fine; chains are seldom more than fourteen; and the gold coins of the United States are about eleven parts of gold and one of copper. Coins wear in passing from one person to another, and that is why the edges are milled, so that it may be more easily seen when they have become too light to be used as coins. When such pieces come into the hands of the government, they must be recoined.

145 (2064)

1. What four valuable qualities of gold are mentioned here?
2. How much alloy is there in gold that is twenty-four carats fine?
3. What is a "carat"?
4. What are the proportions of gold and alloy in U.S. gold coins?
5. Why are the edges of coins milled?

EXERCISE II

A BRAVE HAWAIIAN PRINCESS

From Mirick and Holmes, *Home Life Around the World*

(This exercise consists of paragraphs in which the sentences have been disarranged. The sentences are numbered. The task of the pupil is to decide in what order the sentences should be read in order to give proper sequence to the author's thoughts. The proper order can be easily indicated either orally or in writing by means of the numbers at the beginning of each sentence.)

I

1. He had a beautiful daughter named Kapiolani.
2. The home of this king and of the princess was near the great volcano from which ever rises the white cloud of steam that is seen far out on the waters of the ocean.
3. In the days, long ago, when Kaluhe had grown to manhood, there was a powerful king who ruled the brown-skinned, savage people of the Hawaiian Islands.

II

1. One was named "Fiery-Eyed-Canoe-Breaker."
2. The mightiest of these spirits, and their ruler, was the goddess, Pele.
3. Kapiolani, the king, and all the people, believed that the terrible fire-mountain, as they called the volcano, was the home of evil spirits.
4. Another was called "Red-Hot-Mountain-Lifting-Clouds," and the others had equally terrifying names.
5. Pele had several sisters.

III

1. Some sweet, red berries grew there of which they were very fond.
2. "Some we also eat."
3. These simple-minded savages were very careful not to displease Pele and her sisters.
4. "Pele, here are your berries. We give some to you."
5. They were particularly careful not to take anything that grew near the volcano without asking permission of the goddess.
6. Then they ate all they wanted without fear, because they thought the spirit was pleased with their gift.
7. But when they picked them they were accustomed to throw a few in the direction of the crater, saying:

IV

1. This story of Pele and the ocean spirits was one that Nalima used to tell Kaluhe as they sat together under the palm trees making cloth.
2. They also went on long journeys and had strange adventures.
3. It was supposed that these fire-spirits sometimes quarreled.

V

1. At his command they leaped up the sides of the volcano.
2. Pele replied from her home in the volcano, "You are not my master. I refuse to obey you."
3. Once upon a time the god of the ocean became very angry with Pele, the fire-spirit, because she would not obey him.
4. They flowed over the edge of the crater and filled it full of water to the very top.
5. Then the god of the ocean summoned his water-spirits.
6. He came one day to the foot of the fire-mountain and shouted, "Pele, come forth."
7. Huge waves rolled in from the boundless sea, and piled one on top of the other on the shore.

VI

1. All the waters to the last drop were hurled from the crater back to their home in the ocean.
2. Together they set to work to drive the water-spirits from their home.
3. For one short moment it seemed that Pele and the other fire-spirits were drowned and that their fires were quenched forever.
4. They rushed to help her.
5. But she cried aloud to her sisters.
6. Then they heated them still more and great clouds of steam rose into the air.
7. First they heated the waters until they boiled.
8. So Pele ruled once more in her mountain.
9. There was a fearful explosion.
10. Almost in despair, exerting all their power, they heated the water many times hotter than before.

VII

1. The savages of the Hawaiian Islands believed such stories as this until white people from our own country went to

them and taught them that there were neither water-spirits nor fire-spirits.

2. The beautiful princess, Kapiolani, determined to prove to her people that they need fear these spirits no longer.
3. How she did it is told in the following story.

VIII

1. When, at night, the fires of the crater lit up the sky and the earth shook, the mountain rumbled, and the lava gushed up over its edge and flowed down the mountain-side, she used to tremble with fear as she lay on her bed of grass-mats and pray to the fire-spirits to protect her from harm.
2. When Kapiolani was a little girl, she had been taught to fear Pele and her sisters.
3. Many times she had gone to the mountain to pick the sacred berries, but had never dared eat them until some had been offered to the goddess.

IX

1. She had come to believe that there was no Pele and that there were no fire-spirits.
2. But they would not believe unless she proved it to them.
3. She wanted her people to believe this also.
4. But now she had grown to be a woman.

X

1. If I come back unhurt, you will know that there are no fire-spirits.
2. So one day she walked up the side of the fire-mountain with a great company of her people.
3. But she said, "I will descend into the crater."
4. As they came near the crater, they urged her to go back.
5. "If I do not return safe, continue to fear Pele."

XI

1. All expected the angry goddess to appear and burn up the daring princess.
2. She pushed a stick into the sacred ashes. She ate the sacred berries of Pele in her very home. She cried aloud to the spirits to destroy her if they could.
3. Then she went down into the crater with a few who were willing to die with her.
4. From that time the people ceased believing in fire-spirits, and they loved and honored their beautiful princess even more than they had before.
5. But when she stood unharmed and returned in safety, they shouted, "There is no Pele! There are no fire-spirits."

XII

1. Since the time when the white people taught Kapiolani not to believe in the fire-spirits, people have gone there from many lands, not only from our own country, but from China, Japan, and from Portugal and Italy.
2. To-day the Hawaiian Islands belong to the United States.
3. All these things happened a hundred years ago.
4. They have cleared away the jungles and have planted tropical gardens in their place — plantations of sugar, rice, coffee, and pineapples.
5. The beautiful city of Honolulu now stands where Kaluhe once lived.
6. Instead of grass huts we shall find neat little cottages of wood.

EXERCISE III

(In this exercise words are omitted from the text. These words are listed at the top of each section. The pupils are to fill in the blanks with the proper words as they read. Each word can be used but once in a section. There are some words in each list that do not belong in any of the blanks.)

GRANNIE AND THE TWINS

From Perkins, *The Cave Twins*

I

Stirred, sticks, she, acorns, lap, sat, mouth, sun, trees, woman, reach, piece, burning, front, sat, vast, spring.

One bright morning of early . . . . . . , long ages ago, the sun peered through the . . . . . . on the edge of a . . . . . . forest, and sent a shaft of yellow sunlight right into the . . . . . . of a great, dark cave. In . . . . . . of the cave a bright fire was burning, and on a rock before it . . . . . . an old woman. In her lap was a . . . . . . of birch-bark, and on the bark was a heap of . . . . She was roasting them in the ashes and eating them. At her right hand, within easy . . . . . . , there was a pile of broken . . . . . . and tree branches, and every now and then the old . . . . . . put on fresh wood and . . . . . . the coals to keep the fire bright.

II

Nor, climbed, there, shore, shining, where, down, blue, forests, any, far, lay, slightest.

A little path ran from the front of the cave . . . . . . the old woman sat, down the sloping hillside to a . . . . . . river, and the morning sun . . . . . . across it made a bridge of dazzling light from shore to shore.

Beyond the river . . . . . . were green fields and forests, and beyond the . . . . . . high hills over which the sun . . . . . . every morning. What lay beyond those . . . . . . blue hills neither the old woman . . . . . . any of the clan of the Black Bear had the . . . . . . idea.

III

From, sizzling, sound, lit, beginning, trees, seemed, cracked, made, no, above, little, way, long.

Everything . . . . . . quiet and peaceful on that spring morning so . . . . . . ago. The trees were . . . . . . to turn green and little

plants were already pushing their .. .. .. through the carpet of dead leaves. A robin .. .. .. upon the branches of a tree .. .. .. the cave and sang his morning song.

There was no other sound except the .. .. .. of a wet stick upon the fire, and the snapping noise .. .. ..by the old woman when she took a roasted acorn .. .. .. the fire and .. .. .. it with her teeth.

IV

Comb, really, been, hair, twig, covered, not, ragged, her, long, could, only.

The old woman was .. .. .. pretty to look at. Her face was brown as leather and .. .. .. with wrinkles, and her hair hung about it in .. .. .. gray locks. It was no wonder that her .. .. .. was rough and ragged, for it had never been combed her whole life .. .. .., and she was quite old — oh, as old as forty, maybe! But she .. .. .. could n't help her hair being like that any more than she .. .. .. help being forty, because there was not a single .. .. .. yet made in the whole world!

V

Nothing, leather, nuts, teeth, watch, left, noise, brown.

It was a mystery how she cracked the .. .. .. so well, because she had only a few .. .. .. left in her mouth. For clothing she had .. .. .. but the skin of a deer fastened over her .. .. .. shoulder by a thorn, and tied around her waist by a .. .. .. thong.

VI

Roasted, dry, rustling, and, kept, she, nothing, in, unusual, against, there, an.

Although she seemed to be thinking of . . . . . . but her nuts, the little bright eyes of the old woman . . . . . . close watch in every direction, and her ears . . . . . . quick to hear every . . . . . . sound. If a twig snapped, or there was a . . . . . . noise in the underbrush, she was ready in . . . . . . instant to fling fresh . . . . .

sticks on the fire and make it glow red . . . . . . the black opening of the cave.

VII

Quietly, puzzled, fox, both, sheltered, see, leap, wild, how, faintest, girls, tell, alike, were, size, stealthily, dare.

She knew that no . . . . . . animal, however fierce and hungry, would . . . . . . come near the leaping flames. Yet watchful as she was, she did not . . . . . . two children who were creeping . . . . . . toward her, over the great rocks which . . . . . . the mouth of the cave.

They were a boy and a girl, and from their . . . . . . they must have been about eight years old. They . . . . . . had bright twinkling eyes and flaming red hair, and were dressed . . . . . . in skins of red foxes of almost the same color. You could . . . . . . at a glance that they were twins, but it would have . . . . . . any one to tell whether they were both boys or both . . . . . ., or one of each kind. They came down over the rocks so . . . . . . that not even the quick ears of the old woman heard the . . . . . . sound.

VIII

Darkness, over, fire, near, sudden, their, two, almost, fours, she, right, simple, instant.

When they had . . . . . . reached the ground, they stopped, and at the same . . . . . . opened their mouths and howled exactly like . . . . . . young wolves!

The noise was so . . . . . . and so near that the old woman never thought of her . . . . . . at all. She simply screamed and fell . . . . . . over backwards into the cave. Then she rolled over and scuttled on all . . . . . . out of sight in the . . . . . . as fast as she could go.

IX

Scolded, they, back, with, acorns, dance, jumped, red, stout, like, angry.

The acorns in her lap flew in every . . . . . . and rolled down the hillside. The boy and girl . . . . . . to the ground, shrieking

with laughter. In a moment the old woman was . . . . . . again in the door of the cave. She had a . . . . . . stick in her hand and she looked very angry. She shook the stick at the Twins and . . . . . . them so fast that the sound of it was like the chattering of an . . . . . . squirrel in a tree-top.

X

Can't, shrieking, while, taste, catch, best, just, this, English, you, teach, not, river, until, reach.

Now, of course, I cannot tell you . . . . . . the words she used, but, translated into . . . . . ., this is what she said: —

"You horrid little catamounts, if I . . . . . . you, ... I'll . . . . . . you better manners! I'll give you such a . . . . . . of this stick that you'll not need more till the . . . . . . runs dry."

The twins sprang up, still . . . . . . with laughter, and danced about the fire just out of . . . . . . of the woman's stick.

"But you . . . . . . catch us," they screamed.

XI

Heart, afraid, wonder, fire, sticks, her, were, they, flew, looked, angry, glared, head, scare, heads.

Their red locks of hair . . . . . . about in the wind as they danced, until it . . . . . . almost as if red flames . . . . . . bursting from their heads. The old woman . . . . . . at them helplessly.

"Dance away," she cried, "dance away, you red-headed rascals! I shan't need to put . . . . . . on the fire while you are here. Your red hair would . . . . . . away the saber-toothed tiger himself! No . . . . . . you are not afraid to run in the forest alone! With such . . . . . . on you, you are as safe as if you were in the . . . . . . of the cave."

EXERCISE IV

(This type of exercise is designed to make the job of learning the meanings of unfamiliar words a pleasant game instead of a monotonous task. Instead of hunting in the dictionary for the definitions of words, the pupils are given the definition and then they read to find the word which fits the definition.)

WATER IN THE AIR

From Van Buskirk and Smith, *The Science of Everyday Life*, pp. 105–06

Water is always present in the air in the form of an invisible gas called *water vapor*. In order to understand how the air contains water in a gaseous form it is helpful to compare it with a sponge. (1) A sponge can hold water. So can the air hold water in the form of water vapor. Water in a liquid form is able to soak in between the parts of the sponge. In some such way it is possible for water vapor to be soaked up by the air. (2) The sponge can hold only a limited amount of water. That is also true of the air in regard to water vapor. (3) When a sponge is holding all the water possible it is said to be *saturated*. The same expression is used with reference to the air when it is holding all the water vapor it can.

Find words in the above paragraph to fit the following definitions:

1. To examine in order to discover likeness and unlikeness.
2. Filled to the limit of capacity with liquid.
3. Cannot be seen.
4. In the form of gas.

The air gets its water vapor by means of a process called *evaporation*. This is the changing of water from a visible liquid into an invisible gas. The rapidity of the process of evaporation depends upon four factors: (1) the amount of water vapor already present in the air; (2) the temperature; (3) the air-pressure; (4) movement of the air.

If the air is already saturated with water vapor, it is impossible for more vapor to enter, just as it is impossible for a sponge to soak up more water when it is saturated. Dry air, on the other hand, allows water to enter easily.

Heat increases the rapidity of evaporation. Especially when the sun is shining and the air is warm, large quantities of water are evaporated from the surface of the earth, particularly from the surfaces of rivers, lakes, and oceans.

1. The process of a liquid changing into a gas.
2. Makes greater.

3. Able to be seen.
4. Being in a certain place; being at hand.
5. An act which continues and progresses; an operation.
6. Uncertain amounts of anything; anything that can be increased, divided, or measured.

The third factor which helps to determine the rapidity of evaporation is the air-pressure. There is more rapid evaporation when the air-pressure is low. By using an exhaust-pump, thus reducing the pressure of the air, it is possible to make water evaporate so quickly that it actually boils when cool. The commotion of boiling is caused by the *expansion* or enlargement of particles of the liquid into a gaseous form. This change occurs close to the applied heat. As water vapor occupies about sixteen hundred times the space formerly occupied by the water, it is much lighter and rises to the surface in the form of bubbles. Up in the tops of high mountains boiling is not sufficient to cook some kinds of food. Why is this so?

Evaporation takes place more rapidly in moving air than in still air. After a rain the streets dry quickly if the wind is strong.

1. Increase in size or extent.
2. Making smaller.
3. Fills.
4. To fix, settle, or decide.
5. In truth; really.
6. Any thing or circumstance which helps to bring about a certain result.
7. Takes place; happens.
8. Violent agitation; tumult; disorder.
9. Enough.
10. Small pieces.

The oceans of the world are the greatest source of the water vapor in the air. Large inland bodies of water, such as the Great Lakes and the Amazon River, furnish a large amount, as do all the smaller lakes and rivers. The surface of the solid earth is also constantly losing water to the air. When winds blow from a cool to a warmer region, they keep increasing their

capacity to hold water, and absorb moisture from anything they can. The trade winds, for example, blow toward the hottest parts of the earth. They cause so much water to be evaporated from the earth that many of the regions over which they blow are deserts. Other sources of water in the air are the living bodies of plants and animals.

1. Power of receiving or containing.
2. Those things from which anything arises or originates.
3. To drink in; to suck or swallow up; to take in.
4. The form taken by liquids or solids under the influence of heat, or reduction of pressure.
5. All the time; continually.
6. The upper side or face of anything.

Plants are constantly giving off water by evaporation. Some of it is a result of breathing, since water is formed among other substances when food is oxidized in the cells.

By far the largest amount of water that is given off by plants, however, is *transpired*. As you know, plants absorb much water from the soil, and along with it, mineral foods that the soil contains. When it enters the roots of the plants, the water, containing the mineral food, passes from cell to cell in the plant body. Since more water flows through the plant than can be used to manufacture plant food, some of it is evaporated through the openings in the leaves to the outside air. The amount that may evaporate is very great. A grass plant may transpire in one day more than its weight. Botanists have estimated that about half a ton of water may evaporate in a day from an ordinary city lot covered with grass. The process by which water passes out of the leaves is called *transpiration*.

1. To pass off as vapor; to breathe out.
2. That which is real; matter or material from which anything is made.
3. Reckoned; computed.
4. Usual; common.
5. To be changed into an oxide.
6. The act of breathing out or passing off as vapor.

EXERCISE V

(This type of exercise is designed to develop the habit of concentration on the part of the pupils. They like it because of the puzzle element involved.)

DISARRANGED SENTENCES

From Tappan's *The Story of the Roman People*, pp. 99–100

1. The countries circling / "the world" meant / conquered Hannibal, / around the Mediterranean Sea / when the Romans / at the time.
2. The Romans now / lying to the west / of Italy, / held the chief power / in all the lands.
3. They had already / toward the east / when they suppressed / and agreed to protect / taken one step / the pirates of the Adriatic Sea / the Adriatic coast / the Greek cities along.
4. But the condition / Greece could have protected / since those days / in earlier times / her own cities, / had changed greatly / of affairs in the East.
5. When the Romans / Alexander the Great began / were subduing the Latins, / about the time / his conquests.
6. Philip II, had left him / but this was a small / his father / a wonderful series / realm compared with what he / and he began / meant to win, / of victories, / Macedonia and Greece.
7. But also / and part of India / not only Macedonia and Greece, / Asia Minor, Syria, Egypt, Persia, / when he died, he ruled.
8. Empire / among / this / was / divided / generals / his.
9. Have governed this / could not / but his generals / himself could / possibly Alexander / enormous domain.
10. And finally the / they and / vast empire broke up / their successors / into three kingdoms / quarreled and fought / 1. Egypt. 2. Syria and Asia Minor. 3. Macedonia and Greece.

11. Cities which were under / While the Romans / the king of Macedonia, Philip V, / were contending with Hannibal / attacked some Greek / the protection of Rome / who was an ally of the Carthaginians, /
12. First / this / Macedonian / led / to / war / the.
13. And with most / was subdued, / excellent reason / with Philip again, / after Hannibal / war broke out.
14. Antiochus of Syria / divide Egypt / plotted to / he and King / between them.
15. Philip would control / the Ægean Sea / on the shores of / the Greek cities / if this plan should succeed.
16. Came much of / a vast amount of trading / Ægean Sea, the Black Sea, and the eastern part of the Mediterranean, / was carried on in the / needed in Italy / part of the world / the grain / and from this.
17. Of her food / if Philip was successful, then he, / whenever he chose / a large part / an enemy of Rome, / could shut off.
18. Of the Romans / to arouse / this was enough / the interest.
19. Might think / not trouble himself / about what the Romans / Philip did / but attacked Egypt and Athens.
20. And his guardians / was a boy / appealed to Rome / the king of Egypt / for help.
21. That had for / as for Athens / of the Romans / some time been / an ally.
22. Of her people / not to harass / the friends / Rome warned Philip.
23. That Macedonia / as Rome / Philip replied that / but if they / he should prefer peace / was as powerful / they would learn / wished to fight.
24. Two ranges of hills, met in Greece / and shaped like / of Philip and the Romans / at the Cynocephalæ, or *dogs' heads*, / then the armies / the heads of dogs.
25. General Flaminius / by the Roman / thoroughly defeated / Philip was.

EXERCISE VI

(Material selected from Winslow's *The United States*,[1] and arranged to bring out the chief thought or topic in each section.)

PHYSICAL FEATURES OF THE SOUTHERN SECTION

SECTION 1

QUESTION: How do the physical features of the southeastern part of the United States differ from those of the northeastern part?

In passing from the northeastern part of the country to the southeastern part, we go from a region of rocky hills and many lakes to one containing a great amount of comparatively level land, well suited to agriculture. The Appalachian system of mountains extends nearly across the eastern part of this section. In the South, as in the North, these ancient mountains have been so worn down that in places they have become mere hills, or even level land. In North Carolina and Tennessee there are still hills and mountains of considerable height. Mount Mitchell, the highest of the system, is more than a mile high.

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SECTION 2

QUESTION: What is the Piedmont Belt?

A wide belt of country lying next to the mountains on the east is nearly level, or covered with low hills with river valleys among them. This section is sometimes called the Piedmont Belt. The word *piedmont* means *foot of the mountain.* The name is given to the section because it lies along the foot of the Appalachian Mountains, where the land has been formed by the wearing away of the mountains.

72 (178)

[1] Winslow, Isaac Oscar, *The United States*, pp. 91 ff. Boston: D. C. Heath and Company, 1910.

SECTION 3

PROBLEM: Explain the formation of the Atlantic coastal plain.

The strip of country between the Piedmont Belt and the ocean is generally low, level, and sandy. It is a part of the Atlantic coastal plain. All this land was once beneath the ocean. The soil was formed by the wearing effect of waves on the shore, or from mud carried into the ocean by rivers.

56 (234)

SECTION 4

QUESTION: How do the northern and southern coasts differ?

There is a striking contrast between the northern and southern coasts. While in the North the sinking of the lands has produced islands, drowned valleys, and deep harbors, in the South the land has risen enough to make dry land of a strip of the ocean bed. Since mud was spread evenly by the waves over the ocean floor, this floor became level land after it rose above the water. The even bed of the ocean made an unbroken coast line, without many capes and bays.

86 (320)

SECTION 5

QUESTION: What are barrier reefs?

Since this period of rising, the southern coast has settled again a very little. This has been an advantage by increasing the depth of water in the mouths of rivers and in the harbors. In the shallow water near the shore the waves have washed up sand from the bottom and formed long islands called sand bars or barrier reefs. In a similar manner a low coastal plain has been formed along the Gulf of Mexico.

75 (395)

SECTION 6

QUESTION: What are the Florida Keys?

A large part of southern Florida is elevated but little above the sea, and portions of it consist of extensive marshes or

swamps. The largest of these is called the Everglades. The islands near the southern coast are called the Florida Keys from a Spanish word which means islands.

49 (444)

Section 7

Question: How are coral reefs and islands formed?

The surface of portions of the land in southern Florida and upon the Keys has been formed by minute animals called coral *polyps*. In parts of the ocean where the water is warm and shallow these animals live in great numbers attached to the bottom, and when they die their stony skeletons remain. They continually grow and die, and as the masses are raised above the surface, coral reefs or coral islands are formed, which the force of the waves slowly crumbles into soil.

84 (528)

Section 8

Question: What three States of the Southern Section have no seacoast?

In the Southern Section we may include the States bordering on the Atlantic Ocean and the Gulf of Mexico, from North Carolina to Texas, and the States of Tennessee, Arkansas, and Oklahoma.

32 (560)

Section 9

Question: Why has the development of the resources of this section been so slow?

These States, which are usually called the Southern States, are among the richest possessions of the country. For many years they have suffered the terrible results of the Civil War, in which they lost a vast amount of property and the lives of many of their bravest young men. But since the close of that war they have advanced rapidly in wealth and general prosperity.

65 (625)

SECTION 10

PROBLEM: Give some comparisons to illustrate the size of Texas.

When the rich and well-watered lands of the "sunny South" are fully occupied and cultivated, they will provide homes for many millions of people. Texas is the largest of all our States. It is difficult to realize its size. It contains four times as much territory as the whole of New England. It is larger than any country of Europe except Russia. It is believed that it will at some time be able to support one half as many people as the whole country now contains.

87 (712)

EXERCISE VII

(Showing the adaptability of encyclopædic material to effective silent-reading drill.)

THE STORY OF COAL[1]

SECTION 1

Ages before man lived upon the earth portions of it were covered with a dense growth of vegetation far more luxuriant than that found now in the densest tropical jungle. By the lowering of the level of the land these dense forests were covered by the ocean, and while resting for ages on the bottom of the sea they were buried by mud. The land again rose and appeared above the ocean. The mud was hardened into rock and the buried vegetation by heat and pressure was turned into coal. This process was repeated many times through the uncounted ages and for this reason we find the coal in veins, one above another and separated from each other by layers of rock. Green plants can grow only in direct sunlight. Since the plants of the coal period owed their growth to the influence of the sun, and since the heat energy released by burning the coal is the same energy gathered from the sun's rays and stored in their

[1] O'Shea, M. V., editor, *et al.* *World Book*, vol. III, pp. 1442–43. Chicago: W. F. Quarrie and Company.

tissues ages ago by the plants from which the coal is made, coal is sometimes called *buried sunshine*, a very appropriate name.

191

QUESTIONS:

1. How did the dense forests of the coal period come to be covered with water?
2. What happened to them while thus buried?
3. Did the mud become rock under water or above?
4. By what means did the buried vegetation become coal?
5. Why is coal found in veins one above another?
6. What is the origin of the layers of rock separating the coal veins?
7. Why is BURIED SUNSHINE an appropriate name for coal?

SECTION 2

Mineral coal, as hard and soft coal is generally called, differs from charcoal in several particulars. Since it was formed under great pressure it is more compact, and since the air was practically excluded during its formation many of the gases which are driven off in making charcoal were changed into substances that combined with the coal. These are compounds of hydrogen and carbon with a few other substances and their presence in varying proportions gives us the different varieties of coal.

81 (272)

QUESTIONS:

1. What name is applied to both hard and soft coal?
2. Why is coal more solid and compact than charcoal?
3. When coal is being formed, what becomes of the gases that cannot escape because of lack of air?
4. Why is air practically excluded during the process of coal formation?
5. What are the chief chemical elements composing these compounds?
6. What causes the difference in the different varieties of coal?

SECTION 3

Three general varieties of coal are recognized in commerce. The classification is founded on the degree of hardness and the varieties are *anthracite*, *bituminous*, and *lignite*.

Anthracite is the hardest and best variety. It is often called *stone coal* because it is so hard and is supposed to have been the first coal formed, since it occurs deep in the earth. It was probably subjected to greater heat than bituminous coal, since it is almost pure carbon. The most extensive anthracite mines are in Eastern Pennsylvania. The veins do not lie horizontally, for they have been moved by mighty convulsions of the earth. Some are near the surface, while others are found at great depths. Anthracite burns with little or no flame and without smoke, and produces intense heat. Its chief uses are for warming dwellings and for manufacture of water-gas.

143 (415)

QUESTIONS:

1. Into what three general varieties is coal classified?
2. What is the basis of classification?
3. Why is anthracite often called *stone coal?*
4. What is supposed to be true of anthracite coal on account of its being found so deep in the earth?
5. Why is it believed that anthracite was subjected to greater heat than bituminous coal in the process of formation?
6. Which variety of coal contains the highest percentage of carbon?
7. What is Eastern Pennsylvania noted for?
8. If anthracite coal was formed at great depths, why is it sometimes found at or near the surface of the earth?
9. What are the chief uses of anthracite coal?

I have devoted considerable space to the preceding silent-reading passages in an attempt to make clear to the reader the kind of material we have found best suited to class drill, and its arrangement in such a way that it can

be utilized by the teacher with the least amount of extra effort on her part.

Ways of Using Silent-Reading Material

There are several different ways in which such material can be handled so as to furnish live class drill. They may be summarized as follows:

1. The simplest way, and the one which demands least extra work on the teacher's part, is to give the class a certain amount of time in which to read a definite amount of material and then call upon one of the class to tell, with books closed, as much as he can remember of what he has read. While he recites, the rest of the class watch for errors or omissions. When he has finished, other members of the class correct errors of statement and supply important details which he may have left out. This is good drill, but should not be used exclusively. There should be variety in silent-reading drill as well as in any other. The method possesses the special advantage of giving the child a large amount of practice in oral expression under conditions least conducive to self-consciousness. He really has something to say, some one to say it to, and an object in saying it. Ability to think and talk well at the same time develops with surprising rapidity under such conditions.

2. The class may be given a certain amount of material to be read in a limited time; and then, with books closed, the pupils may answer from memory questions asked by the teacher covering the important facts in the assignment. To save valuable time in class, and in order that the questions may be well chosen, they should always be prepared and written down by the teacher beforehand. This is probably the poorest of the methods I am suggesting. It forces rapidity and concentration in the reading; but it

gives the advantage to the child with good memory, and it affords the pupils no definite objective in their reading.

3. The class may be asked questions, the answers to which are given or suggested in the material to be read. Then the pupils read to find the answers. The speed element takes care of itself here, since each child is anxious to be the first to find the answer. In order to give the slower readers a chance it is well to let the faster readers drop out of the game in turn as each answers a question correctly until a question is given to which none of the remaining pupils can find the answer. Then one of the better readers may be permitted to answer it and the whole class will be in the game once more. To illustrate, here is a class of seven pupils:

A B C D E F G

Let A be the first one to discover the answer to the first question asked. He is permitted to answer it, and is thereby automatically debarred from answering the next one unless there is no one else who can answer it. Suppose that B gets the second question, and C the third, and that none of the four remaining pupils can get the answer to the fourth question within a reasonable length of time. The teacher may then appeal to A, B, and C, one of whom may answer the question correctly. Then she begins over again with the whole class. I have never yet seen a class fail to react with interest and enthusiasm to this type of drill. It gives the child a definite aim in his reading, and tends to develop the habit of rapidly skimming a paragraph or a page in search of a definite idea.

4. If the material is definitely arranged for silent-reading work with suitable questions printed before or after each section, or if the teacher's list of prepared questions is put on the board, the class may be asked to read the

questions for themselves as well as to read for the answer. This method has obvious advantages. It makes it absolutely necessary that the questions be prepared beforehand, and it makes the exercise more purely a reading drill.

5. A list of questions covering a certain topic or a certain portion of the text may be put on the board, and the pupils may be given a limited amount of time in which to find and write out as many answers as possible at their seats. Such seat work is much more valuable than merely giving them a book to read at their seats with no time limit and no definite object in view.

Right here let me call attention to the fact that the lists of "map questions" in geographies, especially in the older geographies, furnish an excellent type of silent-reading material either for class drill or seat work. In fact, almost any sort of textbook containing lists of good questions based on the text will afford good material.

These are a few of the ways in which we have varied the silent-reading work in our schools. Other, and perhaps better, ways will doubtless occur to others working along the same lines. Very few of the individual ideas incorporated herein are original with us. Most of them have been used or suggested by other writers. We can claim only the credit of having gleaned them and put them to work extensively and systematically to further our aims.

Any one of the methods listed above possesses this tremendous advantage over oral-reading class drill. Each individual pupil gets much more reading practice. In oral reading, only one pupil can read at a time, but in silent-reading drill when one pupil is reading they are all reading, and reading intensively with their attention concentrated on their work. Hence, if there are ten pupils in the class, each pupil gets ten times as much reading practice. If there are twenty pupils in the class, each one

gets twenty times as much practice, and so on. And it is practice — especially practice with effort — that develops real reading ability.

If any one believes that such changes in methods and materials as I have advocated herein will result in work that is dull and uninteresting to the child, he needs only to try them or to observe them in operation. He will then be convinced of the contrary, unless his mind is so hardened by prejudice that he can see no good in any new thing.

CHAPTER XIV

TEACHING CHILDREN HOW TO STUDY

The title of this chapter may cause one to speculate as to the connection between standardized tests and teaching children how to study. The line of thought runs something like this: the tests measure the results of study; results of study depend on efficiency of study; efficiency of study depends on the child's study habits as certainly as on his natural ability; and good study habits can be formed economically only by special training in the art of study. Hence helping children to improve their study habits is an important part of a systematic testing program designed to increase the efficiency of the schools.

Children do not Know How to Study

If there is any one point upon which everybody engaged in educational work can agree unanimously and unhesitatingly, it is that young people do not know how to study and that most of them do not learn how to study. Well, why should they know how to study or learn how to study? The ability to study efficiently is an acquired art. It can be acquired only through the practice of correct methods, and none too easily at that. Children are not born with the ability to study and usually no one seems to take any very effectual pains to teach them.

And yet, the child's chief occupation for five or six hours per day, five days per week, thirty or forty weeks per year, for from eight to sixteen years, is supposed to be study. Hundreds of thousands of men and women, at a cost of hundreds of millions of dollars per year, are supposed to

be directing the study of the Nation's children. They assign lessons, order the children to study them, and have the children recite them. Still we hear the cry from teachers all along the line in tones of despair: "Children do not know how to study! Children do not learn how to study! If children could but study efficiently, the teacher's life might be worth living!"

But what are teachers doing to help make their lives more worth living? How many of them are making any systematic, persistent efforts to help their pupils learn how to study to the best advantage? All too often the teachers themselves do not know how to study efficiently. Some of them, as I know from annoying experience, cannot even read well enough to translate accurately into action simple printed directions, such as those accompanying standardized tests. If the teachers do not know how to study, they cannot, of course, expect or be expected to have much success in trying to teach children the art of study.

Children must be Taught to Study

Nevertheless, if children are to study efficiently, they must be taught, or rather helped to learn, to study. There is no more reason to expect a child to become expert in the art of study without special training and directed practice than there is to expect a man to become an expert biologist or surgeon without special training. The fact that some few of superior mentality who go on through high school or college become good students because of special aptitude and much practice is no argument that most pupils ought to be able to do likewise. The musical genius, without special training, can improvise delightful music; but most people need special training to make their musical efforts worth hearing. Measured by the amount of worth-while results obtained, assigning a lesson to the

average child with orders to learn it is about on a par with giving a person untrained in music a sheet of music with orders to play it. The results are usually discouraging.

Poor Methods Prevail

Poorly assigned lessons and the customary type of recitation have done much to encourage wrong methods, or rather wrong ideas, of study. Almost universally to the child, and only too often to the teacher, studying and memorizing have become synonymous terms. The child, assigned the next five pages in history, and knowing from experience that he will be thoroughly questioned to test his remembrance of the details of the lesson or called upon to recite from a topic, knows no other resource than to memorize as many items as possible, or to memorize as much of the text verbatim as possible. Quite as often as not the teacher's questions cover so indiscriminately both important facts and inconsequential details that the child does not dare to neglect *any* detail even though he himself may have some decided ideas, and good ones too, as to what are the essential points in the lesson. The memorizing of facts to be repeated in class, or to be elicited in answer to suggestive questions on the part of the teacher, seems to be the dominant feature of so-called "study" in most schools.

Many teachers, realizing the need for training children to study, have made serious attempts to meet the need. Some of them have succeeded in a measure, but more of them have failed through not attacking the problem from the proper angle. In many cases the teachers who failed were fairly good students themselves and were reasonably acquainted with the psychological principles involved in efficient study. They took particular pains to provide an environment as favorable as possible to study. They told

their pupils to be interested in what they were studying, to concentrate their attention, to *think* about what they were reading, to study the relations of facts given in the book, and to associate the new knowledge with what they had learned before. All of this is perfectly sound advice and strictly to the point, but it is for the most part so much Greek to the children; and it would be difficult for them to profit by it through their own unaided efforts even if they could be made to understand it.

What is the use of telling a child to interest himself in something entirely foreign to his natural inclinations when we as adults know perfectly well how practically impossible it is to force a real interest in anything that does not appeal to us? Of what use is it to tell a child that he must keep his attention absolutely fixed on what he is reading at his seat, whether he is interested in it or not, when he has such varied interests of his own outside of school toward which his mind naturally tends to wander? Of what advantage is it to tell him to *think* about what he is reading when he has been given no definite problem to think about? What does the child know about making deliberate mental associations for the purpose of accumulating a store of organized knowledge? So, although the advice is good, it simply does n't "take." The teacher soon becomes discouraged and gives up trying, convinced that the children cannot be taught to study effectively.

And she is right in her conviction. They cannot be *taught* how to study in the sense of being told or shown how. But they can be *helped to learn* to study. A child in the elementary school has no apperceptive basis that will enable him to understand or appreciate the importance of interest, attention, thinking, association, etc., in their relation to effective study, and he has not ordinarily the mental stamina of the superior adult to enable him to

apply them persistently of his own volition even if he were capable of understanding them.

Something more is needed than merely telling a child how to study. He must be given assignments with very definite problems to work out and then be made to study these assignments under conditions that will force unconscious practice of the rules of effective study until proper methods of study become habitual. In other words, the child must be forced to study correctly if he is to learn to study through practice; and he *must* learn through practice if he is to learn at all. But he will never learn to do the thing correctly by practicing it incorrectly and the latter is what most pupils are doing every day in our public schools. The brighter ones who attend school long enough eventually to learn to study with some degree of efficiency acquire their proficiency through the uneconomical process of trial and error by means of which unsuccessful methods of study are recognized in time and dropped while more successful ones are slowly acquired.

Situations which Favor Good Study Habits must be Provided

Thus the child must be helped to learn how to study by being led to study properly. At the same time he is generally incapable of understanding and consciously applying persistently the psychological principles underlying proper methods of study. Hence I say that the child must be obliged to apply these principles, not, of course, by the use of physical force, but through providing study conditions that will compel him to apply them unwittingly.

This can be done without the principles being mentioned as such or being discussed in any way. If the child has no immediate interest in the subject-matter to be studied, then the learning process itself must be made

interesting, or else the subject-matter must be made worth while from the child's point of view by connecting it up definitely with some problem in which he is vitally interested. Concentration must be secured largely through furnishing frequent objects or goals during the study period. The habit of looking for fact relationships must be developed by thought questions which will compel the child to draw inferences from a collection of facts given in the text, and by supervised outline construction. The organization of knowledge through mental associations must be forced upon the child through actual practice in grouping ideas around a central thought and by obliging him to recall previous knowledge and experience in connection with every important idea in the lesson. All this is possible of achievement as soon as the child has acquired independent reading ability, but it cannot be accomplished through ordinary methods of assignment, study, and recitation.

Good Silent-Reading Ability Essential to Study

Elsewhere in this volume it has been stated that efficient study is efficient silent reading. This is entirely true only if we conceive of efficient silent reading as implying not only thorough comprehension of words and sentences, but also the weighing of thoughts, the evaluation of facts, the classification of new ideas presented by the text, and their association with previously accumulated knowledge. If efficient silent reading is held to be merely the comprehension of the author's thoughts as expressed in the text, then the statement needs to be modified somewhat. But even with this less inclusive conception of what constitutes efficient silent reading, it cannot be denied that good silent-reading ability is the basis of all efficient study from books. Rapid silent reading with

comprehension is the most fundamental factor in efficient study. The child cannot be greatly interested in words and sentences that he does not understand. He cannot concentrate with profit on material that has little or no meaning for him. He cannot study the relationships between ideas unless those ideas are comprehended. It is past dispute that a child must know how to read well before he can study well; and he must know how to study before he can produce better results to be measured by standardized tests. Herein lies the connection between this chapter and all that goes before.

Good Silent-Reading Methods Encourage Good Study Habits

In addition to the fact that good silent-reading ability is essential to effective study, I submit that properly directed silent-reading drills furnish the most practical means available for developing good study habits in children through actual practice in the factors of efficient study, namely, interest, attention, thinking, and the correlation and association of ideas. I have said that children must be forced to practice these things by means of study conditions that will compel such practice. Silent-reading drill furnishes the medium through which the forcing can be accomplished. The mental processes involved in effective drill of this sort are almost exactly the same as in efficient study.

The types of silent-reading class drill heretofore described have, with us, proved very effective in holding the child's interest and forcing concentration of attention on the matter being read. Probably more often than otherwise in the content subjects the children have little interest in the subject-matter itself. But they do thoroughly enjoy lively silent-reading class drill. Their interest is

mostly in the immediate objects to be achieved, namely, to see who can read the paragraph or page in the shortest time and understand it well enough to give the principal facts of the assignment from memory and in a connected manner; to see who can be the first to discover, from among the details of the text, the answer to a definite question; or to see who can first discover the main thought of a paragraph. The chief interest is in the spirit of lively competition engendered by these drills; but, nevertheless, the interested, active, enthusiastic coöperation of the pupils is secured under conditions that make for real improvement in ability to study.

It is hard for any one who has never tried these methods to realize the degree to which they force children to concentrate their attention on the work in hand. With the timed-section method it is manifestly impossible for the pupil to reproduce completely and coherently the main thoughts of the section read unless he has read it attentively; and, since no one but the teacher knows who is going to be called upon to recite after the reading, every member of the class must read attentively. With the question method, even though most of the questions are answered directly in the text, the child must read attentively and understandingly if he is not to miss the answers when he comes to them. If the answer to a question is merely suggested by a fact mentioned in the text, so much greater is the demand on the attention of the reader and real thinking is introduced as an element in the reading. If the answer to a question must be inferred from several related facts given in the text, then the highest type of reading ability is demanded in that the child must not only concentrate his attention on what he is reading, but he must do real thinking in associating various ideas with each other in their proper relations and with the main

idea expressed in the question. Furthermore, he must hold the main thought in mind all the time he is doing the reading in order not to miss pertinent facts expressed in the text.

Some Examples

Let me illustrate some of these points. Here is a section the answers to which can be taken directly from the text.

The sugar maple, otherwise known as the hard maple, is one of the very best of our shade trees. It is well shaped, affords dense shade during summer, and in autumn becomes beautiful because of the rich and varied colors of its foliage. In the spring its blossoms unfold with the leaves. It grows more slowly than the soft maples, but it requires less moisture and is more useful and durable.

Questions:

1. Why is the sugar maple a beautiful tree in autumn?
2. Which comes first, the blossoms or the leaves?
3. Which grows faster, the hard or soft maple?

These three questions are given in order of difficulty, or of their thought-producing power. The first answer can be taken directly from the text; " because of the rich and varied colors of its foliage." The second question requires understanding of the fact that, in the sugar maple, the leaves and flowers appear at the same time. The third one goes a step farther and requires that the pronoun " it " be associated with the maple tree, its antecedent, and that the terms " sugar maple " and " hard maple " be associated in the mind as representing the same thing.

Here is another paragraph with a question that requires still more thought on the part of the reader.

Maple sugar, like that made from sugar cane, is darker than ordinary brown sugar, unless the impurities are removed. To

do this, milk or beaten eggs are stirred into the boiling sap. This causes most of the coloring matter to rise to the top and mingle with the froth, which is then skimmed off. Those who live near sugar bushes enjoy making and eating maple wax. This is formed by letting the hot sirup fall on snow or ice.

QUESTION: How may light-colored maple sugar be obtained?

It is evident that finding the correct answer to this question necessitates some real thinking and association of ideas on the part of the pupil. He must connect up the ideas that maple sugar is ordinarily dark in color, that the dark color is due to colored impurities, and that these impurities can be gotten rid of in a certain way.

The following paragraph and questions demand even greater concentration and still more extensive thinking on the part of the pupil if he is to answer them correctly.

The leaves are the food-making organs of the plant, and the sugar that is made from maple sap in the spring was made the summer before by the leaves of the tree. As the sugar is manufactured it passes down from the leaves into the trunk and roots of the tree, and is stored in the living cells of these parts in the form of starch. Then when food is needed in the spring to enable the buds to grow and expand into blossoms and leaves, and to produce the seeds, the starch is changed back to sugar, which is dissolved out of the storage cells and carried upward in the sap.

QUESTIONS: Is there much sugar in the roots of the maple tree in winter? Why?

All the data required for inferring a correct answer to these questions are given in the paragraph. But in order to obtain the correct answer, the reader must comprehend several facts in their proper relation, namely, that during the summer the leaves of the maple tree manufacture more food in the form of sugar than is needed by the tree for immediate use; that this surplus food is carried to the

roots where it is stored for use the following spring; and that the soluble sugar is changed to insoluble starch as it is stored in the living cells of the roots, remaining there as starch until the following spring when the sap begins to rise. Hence in winter there is little if any sugar in the roots of the tree. The understanding and correlating of these facts so that the correct answer may be inferred calls for much practice in real thinking.

Habits thus Developed Carry over into Other Work

In this way good silent-reading drill compels practice in proper methods of study. Such practice tends to develop good study habits which may logically be expected to carry over into such a closely related activity as seat study. That they do carry over, and thus improve the pupil's ability to study by himself even poorly assigned lessons in the content subjects, is evidenced by the number of teachers who have spoken to me regarding the greatly improved study ability of the majority of the children after one or two years of intensive drills of the type described in the chapters on silent reading. Other proof lies in the fact that the pupils' test scores in the content subjects, very low in the first tests, are increasing at much more than the normal rate, while, at the same time, no extra time or special drills have been given in these subjects other than connecting them up with the silent-reading word. Other types of silent-reading drill, to be described hereafter, serve to stimulate still more strongly the higher thought processes and are thus still more conducive to the development of good study habits.

Study should also be Directed or Supervised

A fair proportion of school time devoted to silent-reading class drills, in which the teacher employs the methods and

kinds of material used in the better schools of this district, and described and illustrated in the two preceding chapters, together with properly assigned lessons in the content subjects, will do much toward solving the problem of helping children to learn to study to good advantage. But such procedure does not include all that can be done to improve study habits of children or to economize study time. In order to get the best results possible, the forced practice in proper methods of study must be on the actual lessons assigned on the content subjects.

Furthermore, if we are to make sure that the conditions under which the studying is done are those most conducive to economy of time in learning, and the development of good study habits in the children, the study must be directed. This brings us to my next topic, namely, "Supervised Study." Because of the obviously close relation between proper supervised study and "teaching how to study," several important things that might be included in this chapter are reserved for fuller discussion in the next.

CHAPTER XV

SUPERVISED STUDY

Possibly the greatest source of waste in the public-school system is the time supposed to be spent by the pupils at their seats or at home in trying to "study" their lessons, by their own unaided efforts. Not infrequently half the pupil's school time is spent in "studying" from books to prepare for the recitations.

Three Types of Activity in "Studying"

Some pupils deliberately idle away their study time because they have no interest whatever in the school or its work. Compelled by law to attend until they are fourteen, or sixteen, or eighteen, as the case may be, they are sullen and obstinate and plan only to kill time until they are old enough to leave school. They are usually of inferior mental ability and the source of most of the serious disciplinary problems. Quite often their attitude toward the school is the result of retardation and consequent discouragement due to the narrowness of a program of school activities which provides no suitable and interesting work for the moron type.

Many other pupils read over their lessons in a dilatory, ineffective manner with their minds constantly wandering to more inviting fields of thought in their own sphere of interests. This is largely because the lessons as assigned present no definite problems in which they are interested. This group usually contains bright and energetic boys and girls who need only to have their school work enlivened and their tasks made definite in order to become inter-

ested and enthusiastic workers. There are still others who do not waste their time in idleness and day-dreaming, but who are busy every minute of their study time. Yet the time and energy even of these pupils are largely wasted because of ineffective methods of study and ill-directed efforts. They are industrious, and of good mentality; and they would really like to study if they but knew how. As it is they merely do the best they can under unfavorable circumstances.

Difficulties in Connection with Supervised Study

A growing realization among educators of the tremendous waste connected with undirected study has led to the development within recent years of various plans for *supervised study* in the more progressive school systems. The idea of supervised study is good, and it promises much in the way of increased efficiency when it is properly carried out; but, as supervised study is ordinarily conceived, the practical difficulties in the way of its general adoption are prohibitive in the smaller school systems and particularly in the one-teacher rural schools. The main difficulty is for the teacher to find the time both to conduct the recitations and to supervise the study periods. The ideal solution, as it is most generally advocated, is to have two teachers in each room, one to conduct the recitations, and the other to supervise the study of the children at their seats. This would necessitate a doubling of the teaching force that would be financially out of the question in most, if not all, school systems.

Personally I doubt whether this solution would be ideal, even if it were financially practicable. The teacher who supervised the seat study could do little more than see that every child kept busy at his lessons and assist individuals over difficulties. Often her efforts would be duplicated by

having to assist several different pupils over the same difficulty separately. Any attempt to explain or illustrate difficult points to the class as a whole would be apt to interfere with the recitation supposedly going on at the same time in the same room. Of course, keeping the children busy and giving individual assistance to the slower pupils would undoubtedly be beneficial; but the benefits to be derived from such practice would scarcely justify the great additional expense involved.

In school systems where each teacher has to teach only one undivided grade or one division of a grade, the problem of introducing supervised study may be solved with comparative ease and with no additional expense. Under such circumstances the teacher is, for the most part, free during the study periods to direct the studies of the pupils as may seem advisable. But here again, if her efforts are limited to keeping the children busy and to assisting individual pupils, the full possibilities of the study period are far from being realized. What is needed is *directed class study so organized as to develop in the pupils methods of attack that will constantly improve their ability to do independent work.* Merely keeping them busy and assisting them over the rough places will not do this.

Another device, and a more practical one, is the divided period, one part of the period being devoted to supervised study, and the other to the recitation. The recitation may follow the study immediately, or the last half of the period may be given over to study in preparation for the next day's recitation so as to give the pupils a chance to do further study outside of class if they so wish. But even this scheme is available only in high schools where the periods are long, or in schools where the teacher has only one or two grades so that the class period and the study period for each subject can be combined into one fairly

long period. In the smaller school systems, where most or all of the teachers have charge of from four to eight grades, the time of the teacher is necessarily all taken up with recitations and the class periods are so short that division of them is not feasible. In each of these class periods there is little more than time for a hasty testing of the pupil's preparation of the lesson and for the assignment of the new lesson.

Another difficulty lies in the fact that so-called supervised study, in the hands of teachers who do not rightly understand its purposes and possibilities, or who do not care to put themselves to any more trouble than is necessary to enable them to draw so much per week in salary, may degenerate into a procedure more harmful than beneficial. The chief features of such a procedure have been mentioned above, namely, keeping the children busy and giving a certain type of assistance to individuals. Keeping the children busy at their lessons probably can do no harm, but the wrong kind of assistance can do much harm. It is quite possible for the direction and help offered by the teacher to tend to make the child dependent and utterly unable to do a piece of work for himself. In other words, the teacher may make herself a crutch rather than a guide.

The result of this kind of assistance is that children do not learn to work independently. Hence their inability in the upper grades, in high school, and even in college to use their study time to good advantage. The giving of assistance at the right time, in the right way, and in proper amount demands a type of judgment based on a sense of values that is all too rare in teachers. If supervised study is to be nothing more than giving undiscriminating assistance to individual pupils in specific difficulties — and with an unskillful, or careless teacher, it is apt to be little more — we shall probably do better without it.

Supervised study is closely connected with teaching children how to study in that it furnishes the best opportunity for such teaching. Teaching how to study does not involve a systematic course in psychology. It consists in guiding pupils in the actual practice of the art, giving them sufficient directed practice in it to make certain reactions habitual, and then making them conscious of the best methods of study by calling attention to the elements in their study experience that have meant decided success or failure. Any supervised-study plan that does not result in constantly increasing the ability of the pupils to do independent work is largely a failure. Here as often the correct point of view is that a teacher's chief aim should be to make herself as unnecessary to her charges as possible and as soon as possible. Hence we must help children to learn how to study in connection with their actual studying. In order to do this effectively their study must be *properly* directed, or supervised.

Silent-Reading Drill Offers an Opportunity for Supervised Study

Now, I do not propose to submit any complete plan for supervised study that is applicable under any or all conditions. I do not hope to offer a complete solution to a problem that has long been puzzling the minds of much abler men. But I do hope to offer some suggestions that will prove helpful in attempting to solve the problem in actual practice. With this in view I am about to describe some procedures now in vogue in the best schools of my district which appear to help materially along these lines. These practices may or may not be correctly termed "supervised study," but since from them seem to be derived most of the benefits generally ascribed to supervised study, they may well serve as substitutes for the latter,

whatever they may be called. They have two advantages at least: (1) they are applicable so far as I can see in any school or school system however small, and (2) some of them can be handled with profit by any teacher with average intelligence and teaching ability who is willing to give them an honest trial.

I have mentioned in a former chapter how, in our zeal to increase the reading ability of the pupils quickly as the first step in increasing the efficiency of the schools, we decided to amplify the time devoted to reading drill by taking up some of the content subjects, notably physiology and hygiene, and civics, by the silent-reading methods heretofore described. This was by way of experiment and was undertaken at first with considerable misgivings, especially on the part of the teachers. It was feared that the children would not "get" the subjects if they were not studied at their seats and recited in the orthodox fashion.

In order to test the efficacy of these methods in fixing the principal facts of the subject-matter in the minds of the pupils, weekly oral or written quizzes were given together with monthly reviews for which the children prepared by reading over at their seats the ground covered by reading and discussion in class during the month. The results were highly gratifying from the first and soon removed all doubts as to the effectiveness of the procedure. And, from the psychological viewpoint, why should it not be effective? The strict concentration of attention compelled by these silent-reading drills is much more favorable to retention of subject-matter than is the usual perfunctory reading at seat in so-called study. Moreover, the reproduction of the principal thoughts and the class discussion of important points help the pupils to discriminate, consciously or otherwise, regarding the things they ought to remember.

In fact, so effective did this method prove in producing results and improving learning ability that, by the middle of the first year, several of the best teachers of the district were taking up much of the regular geography and history work as silent-reading class drill supplemented by frequent quizzes by way of review. As explained before, practically all of the supplementary historical and geographical reading was taken up in this way in the regular reading classes.

After giving the tests several times and noting the progress made by the pupils in the content subjects in schools using this method, it occurred to me that these silent-reading class drills were proving themselves to be really efficient forms of supervised study. It also seemed clear that with supervised study definitely in view the exercises could be so improved as to develop in the children the ability to think and to organize the facts gleaned from their reading, thus improving still more rapidly their ability to study independently. In short, properly planned silent-reading drills gave promise not only of developing the ability to read rapidly and comprehendingly (which is the very foundation of study ability), but also of stimulating the higher thought processes and of giving actual practice in the art of efficient study.

This idea was presented to the teachers and I found that the same thought had occurred to some of them as a result of their experience with the silent-reading work. Several of them made excellent suggestions and offered to coöperate in developing the idea. It is some of the processes evolved from this beginning that I am about to describe.

The simplest form of silent-reading class drill that can be said to have much real value is the timed-section method which has already been explained in detail. This was the method we used first in all the silent-reading work. It forces concentration of attention and helps greatly in the

accumulation of factual knowledge; but it does not compel much thinking or organization of ideas, and hence is not specially valuable as a means of putting supervised study into effect. Class discussions of the important points in the lessons in their relations to the main topics will, however, help to overcome this defect.

THE QUESTION METHOD IS ESPECIALLY ADVANTAGEOUS

ALTHOUGH the timed-section method has some advantages peculiarly its own and is still much used in reading supplementary material in story form, in the better schools it was soon superseded for supervised study purposes by the question method also described in a former chapter. It remains in general use only by the weaker and less interested teachers of the district. Indeed, it appears to be the only method of silent-reading popular or practicable with that class of teachers since it demands less extra work and less skill in handling. With the question method, however, the questions can be so selected as to call attention to the main points in a lesson and their relations to each other and to the main topic. The pupils may thus be led in spite of themselves to do some real thinking in addition to having the principal facts fixed in their minds and getting the best kind of reading practice.

Let us see how content material can be handled by the question method of silent-reading drill so as to get reading practice, information, and practice in the art of study at the same time. Suppose that the topic to be studied is "The Birch Tree," in Moseley's *Trees, Stars, and Birds*, and that the text assignment is chapter IV, entitled "Birches." The teacher should prepare beforehand a list of questions covering the main points in the lesson. A good share of them should be real thought questions to which the answers can be inferred only by reading so as to

grasp the relationship among the facts given in the text. Most of them should be formed so that they cannot be answered by words or phrases taken directly from the book and without association of ideas by the reader. Of course, when the object is merely to call the attention of the class to some detail whose significance is derived from its bearing upon some thought question to be asked later, a question answered directly by the text is permissible. It would be advisable at first for the teacher inexperienced in the use of this method to make an outline of each topic to be studied and then to frame her questions to cover all the subtopics in the outline.

The Method Illustrated

The following selection is a part of the chapter under consideration divided into sections for silent-reading drill and with suitable questions following each section.

BIRCHES

Section I

Because of their grace and beauty birches are a favorite subject for landscape artists and photographers, and they are frequently planted in parks and on lawns. The white and the paper birch are the species of birch most frequently planted for ornamental purposes. They are especially effective when placed among evergreens, because of the contrast in colors. Many of the white birches have slender, drooping branchlets with deeply cut leaves that might be taken for those of some varieties of maples. White birch grows wild in Europe and Canada and to some extent in our Northern States, but with us the paper birch is more common. Where a forest of spruce or of certain species of pine — as white pine — has been burned, paper birch and aspens spring up. In the abundant sunlight

[1] From Moseley's *Trees, Stars, and Birds*. Copyright, 1919, by World Book Company, Yonkers-on-Hudson, New York.

of the open spaces these trees grow more rapidly than seedlings of the spruce or pine, and a forest of birch and aspen grows up in place of the evergreen forest.

QUESTIONS:

1. Why are birches so frequently planted?
2. What are the two favorite birches for ornamental purposes?
3. Why are they often planted among evergreens?
4. Where does white birch grow wild?
5. Which is the more common in the United States, the white birch or the paper birch?
6. When a forest of spruce or white pine is burned what kinds of trees grow up to take their place?
7. Which grows more rapidly, birches or pines?

SECTION II

The yellow birch has yellowish or silvery-gray bark which has an aromatic odor. The bark of the white birch and paper birch is creamy or pinkish white and splits into paperlike layers. From birch bark the Indians made canoes, as well as boxes, buckets, baskets, kettles, and dishes. In making their canoes they stitched together large plates of birch bark with the fibrous roots of white spruce, coating the seams with resin obtained from spruce and pine trees. In parts of northern Europe the bark of the white birch is used for shingles. Boats made from it are used on the Volga River. From it are made birch oil and birch tar. Russia leather has an aromatic odor due to the oil of birch bark used in tanning it. As the odor repels insects, this leather is valuable for binding books. A few such bindings in a bookcase are a safeguard against insect enemies, and this oil is said also to protect books from mildew.

QUESTIONS:

1. How could you tell the bark of yellow birch from that of white birch if you were blindfolded?
2. What color is the bark of the paper birch?

3. What is said in this section that would indicate the origin of the name "paper birch"?
4. What uses did the Indians make of birch bark?
5. Describe how the Indians made canoes of birch bark.
6. What is the bark of the white birch used for in parts of northern Europe?
7. Name four other uses of birch bark in Europe.
8. Why is Russia leather especially valuable for binding books?

Section III

The wood of the white birch is used as a fuel for smoking hams and herrings, because of the flavor which it imparts. Being light colored, soft, and easily worked, it is used for making spoons, ladles, bowls, and fish casks. Spools, wooden shoes, ox yokes, chairs, and tables also are made from it. Charcoal made from it is burned in forges, and soot made from birch fires is used for making printer's ink. The wood of the paper birch is used for fuel, shoe pegs, spools and toys. The yellow birch and sweet birch yield wood that makes fine furniture and a good interior finish for houses. It is often stained dark red and varnished. It is then said to have a "mahogany finish." Few trees are useful for so many purposes as is the birch.

Questions:

1. Why is white birch wood used as a fuel for smoking meat and fish?
2. Name several things made from white birch wood?
3. What part does the white birch play in the manufacture of printer's ink?
4. Name some things made from the wood of the paper birch.
5. What kinds of birch are used for furniture and finishing lumber?
6. It is often finished in imitation of what costly wood?
7. How does birch wood compare in variety of uses with that of other trees?

Section IV

Have you ever thought of any connection between the size of a tree's leaves and the coarseness or slenderness of its branches? Even in winter, birch trees look quite different from ash or hickory, not merely in color but in the appearance of the branchlets. The function of the branches is to hold the leaves up to the light, and the number of branches required depends on the size of the leaves. Trees with small leaves, like birch, elm, and willow, have very numerous branchlets. Those with large leaves, like ash and hickory, do not require so many branchlets. The leaves themselves reach out to the light and fill up the spaces in the crown of the tree. Most palm trees, of which there are a thousand kinds in the tropics, do not branch at all, but they have immense leaves with long stalks to reach out to the light.

Questions:

1. Of what use to a tree are its branches?
2. Upon what depends the number of branches which a tree needs to have?
3. Why do such trees as the birch and elm need so many branchlets?
4. Which has more branchlets, a hickory or an elm? Why?
5. Seeing a tree in winter, when it is bare of leaves, how could you tell whether its leaves in summer are large or small?
6. Why is it necessary for most palm trees to have very large leaves with long stalks?

Section V

On the twigs or small branches of a tree look for small oblong and elevated places on the bark. These are called *lenticels.* They are breathing pores through which the air can enter to reach the living inner portion of the bark and from which water vapor escapes. On birch and cherry trees the lenticels may be seen not only on the branches but even on the trunks. Here they have become elongated by the growth of the bark.

Lenticels are to be found on all trees. Where the bark is very thick, as it is on old oaks, they are at the bottom of deep cracks.

QUESTIONS:

1. What are lenticels?
2. Where would you look for them?
3. What are they for?
4. What is their shape?
5. On the trunks of what trees may they be seen?
6. What trees do not have lenticels?
7. Why can they not be seen on the trunk of an old elm tree?

Let us consider the first section in detail with a view to discovering how well the questions cover the facts in the text. Most of the important ideas in the section are included in the following list:

1. Birch trees are graceful and beautiful.
2. They are often planted for ornamental purposes.
3. The white and paper birches are the favorites for planting purposes.
4. Their white color is particularly beautiful in contrast with the evergreens.
5. The paper birch is the more common of the two species in this country.
6. The destruction of a forest of spruce or white pine by fire is followed by a growth of paper birches and aspens.
7. Birches are fast growing trees.

Now compare this list with the questions following Section I. Are there any ideas in this list that are not brought out in the questions? Does the list omit any important ideas given in the text? Does the list contain any ideas not pertaining to the main topic? Is there any doubt but that the reading of these questions one at a time and searching out the answers will impress these facts upon the child's mind more surely and permanently than would the mere reading of the text at seat? If you doubt it, try it.

I met with striking evidence on this point during the first year that the method was used in our schools. One day in the fall I demonstrated the method in a certain school for the benefit of the teacher. The reading material was part of the chapter on Petrograd in Carpenter's *Europe*, for which I had a list of questions prepared. This school had a new teacher for the spring term and it became necessary to demonstrate again. I had kept the list of questions in my notebook for demonstration purposes; and I used them again in this same school believing that the children had forgotten all about what they had read hurriedly and but once several months before. To my surprise, several of the children scarcely glanced at the book as I asked the questions in order, but were ready with the answers about as soon as I had finished the questions. Fully half of the questions were answered in this way. If I ever had any doubt as to whether material read in this way would "stick," it disappeared then and there.

The questions pertaining to Section I are not real thought questions. Not every paragraph furnishes data upon which to base such questions. This is one that does not. However, if the reader will examine the other sections in connection with their accompanying questions, he will find a number of questions that demand real thinking if they are to be answered correctly. In fact, the answers to more than half the questions cannot be picked directly from a single word or phrase in the text.

Alternating Supervised Study and Recitation

With questions prepared beforehand, this amount of text can easily be covered in ten minutes. Let us suppose that ten minutes is all the time available for this class. At the end of the period the pupils are told to be prepared for a review of this lesson on the following day. The next day

they are called upon to answer the same questions with their books closed. Discussion of interesting points is encouraged as long as it does not wander too far from the main topic. On the third day another topic is taken up in the text as on the first day, and on the fourth day this topic is reviewed from memory. This process may continue for ten days, and at the end of this time a general review may be given either as an oral or written quiz. The questions for this review are selected from the original lists which the teacher keeps in her notebook.

In this way the reading drill and supervised-study period comes on one day and the recitation on the next. If twenty minutes are available for the class period (or even fifteen if the class is mostly composed of good readers), the period may well be divided even though the lessons have to be shortened. In this case the first half of the period should be devoted to review of the preceding lesson (the recitation) and the last half to the reading of a new lesson (supervised study). Thus the children may have opportunity before the recitation for further study if they so desire. Few of them, however, will find further study necessary. With the divided period, the general reviews may come oftener — say at the end of each week. It is not well to have these reviews cover too much ground; and it is surprising how much ground can be covered in a week with a fifteen or twenty minute divided period. This is especially true if the children are fairly good readers to begin with, and if they as well as the teacher have become accustomed to the method.

One need have no fear that it will be impossible to cover the ground required, if part of the class period, or even every alternate period, is devoted to supervised study of this kind. Fully as much ground can be covered; and, judging from our experience at least, the results will be

quite equal to or even better than those usually obtained by the traditional daily question and answer recitation following a period of unsupervised seat study. With only fifteen minute periods some of our classes cover three or four different texts in one subject in the course of a year, thus obtaining a much broader view of the subject than they could possibly have if they were confined to the study of a single text.

Another advantage is, that if most of the content subjects are handled in this way, ordinary seat study in these subjects becomes less and less necessary for most of the pupils. Accordingly, the time usually spent in seat study can be used for extended supplementary reading or in any other way that may seem advisable. One way of using this time to good advantage is for the teacher to put questions on the board covering assignments in textbooks and to have the children find the answers and write them. Children generally like to do this sort of work. The questions give them something definite to work on at their seat. This type of work, however, should never be allowed to supplant the regular silent-reading class drill, because it takes no account of the speed element in reading nor does it force concentration to anything like the extent that class drill does. Some textbooks contain at the end of chapters excellent lists of questions which may be used for this purpose. Often, however, such lists of questions are not suitable; and the teacher should go over them carefully before assigning them for this type of seat work. Judging from some of these lists, one would almost think that the person who framed the questions had never seen the book. After trying a few such lists the pupils are apt to become discouraged and lose interest — and one cannot blame them.

I believe that this method of handling silent-reading

drill for purposes of supervised study will prove, on the whole, to be one of the most useful that can be devised. It demands less extra work, and less skill on the part of the teacher; and it covers ground more rapidly than most of the other methods. At the same time it produces excellent results from every point of view. On the one hand, it can be used to good advantage by the teacher who is somewhat lacking in originality or initiative after she has had it explained and seen it demonstrated; but on the other hand it furnishes plenty of scope for the abler teacher to display whatever skill she may possess. The more skillfully it is handled, of course, with full understanding of its purposes and possibilities, the more efficient will it prove in developing ability to study independently and the better medium it will be for practice in the art of study. A great deal depends upon the skill and judgment used in framing the questions.

Another Way of Conducting Supervised Study — Finding the Topic of a Paragraph

There are other ways of conducting silent-reading drill, however, ways that make greater demands on thinking ability and that do more to help pupils acquire the ability to grasp relationships among ideas. The ability to organize ideas in their proper relations to each other and to some central idea or group of ideas is an ability that develops only through actual practice. Pupils must be led to do such organizing if they are to learn through practice. These other methods are specially valuable as aids in developing organizing ability in pupils; but they consume much more time and demand much more skill on the part of the teacher if they are to prove successful. Nevertheless, they should be used whenever the requisite time and skill are available, for they help to develop in the child an ability that is vital to his success as a student.

One good type of such silent-reading drill for supervised-study purposes consists in having children read paragraphs from a text which has no paragraph headings or topic sentences, then requiring them to suggest suitable headings or topic sentences for the paragraphs. Get suggestions from as many different pupils as possible for each paragraph and write them all on the board. Then call on the class to decide which one is the best and why. If at first the children seem at a loss to know what is required of them and no suggestions as to suitable paragraph headings are forthcoming, or if from a number of suggested headings no satisfactory decision as to which is the best one can be reached, do not *tell* them and do not be discouraged, but lead them to analyze the paragraph under discussion. Have them consider each sentence or statement in the paragraph with a view to discovering a common or central idea to which each statement or sentence refers.

Let me illustrate. A short article selected at random from an encyclopædia is on Cocoa. Let us proceed to analyze the second paragraph which reads as follows:

The cocoa is a small tropical tree cultivated extensively in Ecuador, Venezuela, Brazil, Saint Thomas Island (off the West African coast), Ceylon, the West Indies, and Central America. Heat, moisture, and a deep rich soil are the conditions which favor its growth. The straight, regular trunk usually attains a height of twenty feet, and puts forth branches which bear shining, oval leaves, dark green above and red underneath. The flowers, which have five narrow, bright-red petals, grow directly from the trunk or from the older branches, and are almost stemless. The fruit, a cucumber-shaped pod with a thick, deeply-grooved rind, has the same peculiarity. Each pod contains many almond-like seeds, covered by a thin, reddish-brown shell, and within each of the seeds is a dark brown kernel, the

valuable portion of the plant. The seeds have the commercial name of *cocoa beans*, while the kernels are called nuts.

Sentence 1. "The cocoa is a small tropical tree cultivated extensively in Ecuador, Venezuela, Brazil, Saint Thomas Island, Ceylon, the West Indies, and Central America." This sentence tells us where the cocoa tree is cultivated.

Sentence 2. "Heat, moisture and a deep rich soil are the conditions favorable to its growth." Growth of what? The cocoa tree.

Sentence 3. "The straight, regular trunk usually attains a height of twenty feet, and puts forth branches which bear shining, oval leaves, dark green above and red underneath." This sentence speaks of trunk, branches, and leaves. Of what? The cocoa tree.

Sentence 4. "The flowers, which have five narrow, bright-red petals, grow directly from the trunk or from the older branches, and are almost stemless." This sentence tells of the flowers and where they grow. Flowers of what? The cocoa tree.

Sentence 5. "The fruit, a cucumber-shaped pod with a thick, deeply-grooved rind, has the same peculiarity." This sentence described the fruit. Of what? The cocoa tree.

Sentence 6. "Each pod contains many almond-like seeds, covered by a thin, reddish-brown shell, and within each of the seeds is a dark brown kernel, the valuable part of the plant." This sentence describes the contents of the pod or fruit. Of what? The cocoa tree.

In this way it is made evident to every member of the class that each sentence in the paragraph has reference to a single central topic, the cocoa tree. The central idea of the paragraph, tersely expressed as a topic, is a paragraph heading; or, briefly expressed as a complete statement, it is a topic sentence.

This is, of course, slow work for the children at first, but it is well worth while. Most of the children will grasp the idea by the time five or six paragraphs have been analyzed,

and after that it is merely a matter of practice. In a surprisingly short time they will acquire the ability to recognize the topics of paragraphs merely by reading them through carefully and thoughtfully, providing, of course, that the material studied is well organized. In selecting material for such drill, the teacher should be very careful to see that it is well organized, especially at first. We have found this type of drill very popular with pupils when handled by an intelligent teacher who knows what she is trying to do.

Sometimes in analyzing a paragraph, ideas will be found that are quite irrelevant to the general topic. Through such analysis the older children at least can be led to recognize this irrelevant material, and it is important that they should be trained to do so. It is just as important, from the viewpoint of developing study ability, for the child to learn to recognize data not pertaining to the subject under consideration as it is for him to learn to recognize pertinent material. Hunting for irrelevant statements in paragraphs might profitably be made a special type of silent-reading exercise to be used with reasonable frequency in the supervised-study period.

Construction of Outlines

Probably there is no more effective kind of supervised study (or silent-reading drill) than is furnished by the construction of lesson outlines in class under the supervision and with the assistance of the teacher — providing, however, that the children are led to do the major part of the thinking and organizing. Not all material is suitable for this kind of work; but whenever such material is found in the texts, it should be utilized so far as time will permit.

The material having been chosen, the first thing to do is to select headings for main topics if good ones are not

given in the textbook. Sometimes the headings given in the books are poorly chosen or not well worded. In such cases it is good practice for the class to reconstruct them or find better ones. Then each paragraph should be carefully analyzed, the relations between ideas studied, and subtopics chosen for groups of related ideas. Finally, the minor details should be grouped under the subtopics which they support.

Let us take the before-mentioned article on cocoa to illustrate drill in the construction of an outline by means of paragraph analysis. Here is the article:

Cocoa (Ko′-ko) (originally Ko-ko′-a) is a reddish-brown powder obtained by grinding the kernels from the seeds of the cacao, or cocoa, tree. It is widely used in making the popular table beverage known as cocoa. The name, now in general use in English-speaking countries, is a corruption of the more correct form, *cacao.*

The cocoa is a small tropical tree cultivated extensively in Ecuador, Venezuela, Brazil, Saint Thomas Island (off the West Coast of Africa), Ceylon, the West Indies, and Central America. Heat, moisture, and a deep rich soil are the conditions which favor its growth. The straight, regular trunk usually attains a height of twenty feet, and puts forth branches which bear shining, oval leaves, dark green above, and red underneath. The flowers, which have five narrow, bright-red petals, grow directly from the trunk or the older branches, and are almost stemless. The fruit, a cucumber-shaped pod with a thick, deeply-grooved rind, has the same peculiarity. Each pod contains many almond-like seeds, covered by a thin, reddish-brown shell, and within each of the seeds is a dark brown kernel, the valuable portion of the plant. The seeds have the commercial name of *cocoa beans*, while the kernels are called *nibs.*

Most of the work of getting the beans ready for shipment is done by negroes. After the pod is picked, a slit is made in the side with a knife; the pods are then broken open with the hand,

and the beans and their enveloping pulp are scooped out and carried to a sweating house to go through a process of fermentation. This fermentation makes the pulp easily removable, and also improves the quality of the kernel. From the sweating house the beans are taken to sieves or troughs and stirred under water until they are clean and smooth. They are then dried, either in the sun or by artificial means. Finally, in order that the beans may be protected against molds and fungous growths, they are finished, or polished. On some plantations the polishing is done by coolies, who dance upon the seeds until every particle of pulp is removed, and the finished product shines. The beans are then placed in bags or barrels and shipped to the different ports of the world, to be sold to manufacturers.

Powdered cocoa, chocolate, and cocoa butter are the chief products of the cocoa beans. In the process of manufacture the seeds are roasted, and the shells removed, and the kernels, or nibs, are placed in a grinding mill with steam-heated rollers. Because of the heat in the rollers the cocoa mass flows out of the mill in the form of a semi-liquid, dark brown paste and can be run into deep pans and allowed to harden. If cocoa is to be made, the mass is remelted and placed in a great press which extracts a large proportion of the fat. The substance is then taken from the press and reduced to a fine powder in a mill consisting of a pair of rollers armed with teeth. Before it is placed on the market the powder is pulverized in a second mill, then is subjected to a thorough sifting. Chocolate is the cocoa mass with the fat left in. If sugar and flavoring are added, the product becomes *sweet chocolate*. The fat extracted from the cocoa is sold under the name of *cocoa butter*, and is used as a basis for creams and pomades for the hair and skin and in candy making. The shells of the cocoa beans, usually regarded as a waste product, are sometimes roasted with coffee to add to its flavor, and in some sections peasants use them as a substitute for tea and coffee.

Now let us examine each sentence in each paragraph and note briefly what it tells us.

PARAGRAPH I

1. What cocoa is and how it is obtained.
2. Its use as a beverage.
3. Derivation of word "cocoa."

PARAGRAPH II

1. The tree and where it is cultivated.
2. Conditions favoring growth.
3. Shape of trunk and shape and color of leaves.
4. Flowers and where they grow.
5. Description of fruit.
6. Contents of pods.
7. Commercial names of seeds and kernels.

PARAGRAPH III

1. Negroes do most of the work.
2. Getting beans from pods.
3. The sweating house and its purpose.
4. Removal of pulp.
5. Cleaning the beans.
6. Drying the beans.
7. Polishing the beans. Why?
8. How polishing is done.
9. Shipment of beans to manufacturers.

PARAGRAPH IV

1. Things made from cocoa beans.
2. Things done to the seeds.
3. Product of grinding.
4. Extraction of oil to make cocoa.
5. Grinding of residue to make cocoa.
6. Second pulverizing and sifting.
7. Chocolate.
8. Sweet chocolate.
9. Cocoa butter and its uses.
10. Use of shells.

Now, with the results of our analysis and the minor details of the paragraphs, we can easily construct our outline as follows:

COCOA

I. Cocoa
 1. What it is
 2. How obtained
 3. Use
 4. Derivation of name

II. The Cocoa Tree
 1. Where it is cultivated
 2. Conditions favoring growth
  (a) Heat
  (b) Moisture
  (c) Soil
 3. Appearance
  (a) Shape of trunk
  (b) Leaves
   A. Shape
   B. Color
 4. Flowers
  (a) Color
  (b) Position on tree
 5. Fruit
  (a) Appearance
  (b) Contents
   A. Commercial names of

III. Preparing Cocoa Beans for Shipment
 1. Kind of labor employed
 2. Getting beans from pods
  (a) How accomplished
 3. Removal of pulp
  (a) Where?
  (b) How?
 4. Cleaning the beans
 5. Drying

6. Polishing
    (a) Purpose
    (b) How accomplished
7. Shipment

IV. Manufacture of Cocoa Products
1. Chief products
2. Process of manufacture
    (a) Roasting
    (b) Shelling
    (c) Grinding of kernels
        A. Method
        B. Product
3. Making cocoa
    (a) Extraction of oil
    (b) Grinding of residue
    (c) Second grinding
    (d) Sifting
4. Chocolate
    (a) What it is
    (b) Sweet chocolate
5. Cocoa butter
    (a) What it is
    (b) Its uses
6. Use of shells

Two or three such outlines worked out in class each term and supplemented by as much seat work along the same lines as may seem practicable will help tremendously in developing the ability to select the main points in a lesson and group the minor details about them. Only by such practice can most pupils learn to recognize and grasp the salient points in what ordinarily appears to them as a dead level of facts to be memorized without discrimination. When the material is so well organized by the author that most of the main thoughts are emphasized by topic sentences and other general statements, the outlining is com-

paratively simple. Such material, however, is the exception rather than the rule. Nevertheless, it should be used, if available, in the first attempts at constructing outlines.

When the main topics must be inferred through the association of groups of related ideas, outlining is quite another matter requiring keen thought and analysis. With judicious assistance by the teacher, however, it is not beyond the abilities of fifth-grade pupils. The chief elements of success in this line of work are, (1) intelligent selection of material, (2) careful study of the material by the teacher before presentation to the class, and (3) skill in presenting in order to lead the children to do most of the thinking.

Collecting Material as a Phase of Study

From constructing outlines of single lessons in a textbook they should be gradually led to the still more difficult and profitable practice of selecting material on a given topic from several books or from other sources and of constructing an outline based on this material. In connection with this work they would learn to use reference books properly and easily, and also the indexes and tables of contents in other books. Very many pupils even in high school scarcely know that books have indexes, and they are very far from connecting them with any practical use in studying. It is a pitiful sight and a sad commentary on the intelligence and diligence of teachers to watch the average pupil try to refer to some particular topic in a book by turning the leaves one at a time and scanning each page for the needed thought instead of turning to the index and locating it in a few seconds.

The ability to organize material gleaned from several sources is particularly important. This kind of work is demanded in colleges and in many high schools. Yet not

a few high-school and college students appear absolutely helpless when called upon to do it. They go through books and magazine articles making copious notes, or rather copying verbatim sentences and paragraphs that seem to pertain to their topic. This can scarcely be called note-taking. Then they connect these scraps together with a superabundance of conjunctions without regard to organization, interject a few phrases and clauses to make smooth reading, and submit the result with a sigh of relief to the instructor. Too often they "get by" with this sort of work because so many of them are incapable of doing anything better.

Outlines constructed as practice exercises in supervised study should be utilized in composition work. Although many pupils in the English classes learn to turn out fairly good work in narrative style, most of them do not know what organization means as applied to expository composition. Practice in this sort of work should begin in the upper grades of the elementary school in connection with supervised study and silent-reading work. Teachers are all too prone to declare that such work is beyond the capabilities of elementary pupils, when the real trouble is in neglect or in lack of teaching skill on the part of the teacher. Of course it is beyond them until they learn how to do it. So is most everything else. But how are they going to learn if they are not given a chance to practice under proper conditions.

In this chapter I have tried to show that effective supervised study is not a Utopian dream possible of realization only in the larger and wealthier school systems; but that it is practicable in any school system wherein the administrators and teachers have the courage, the ambition, and the intelligence to attempt it. The fact that supervised

study, teaching how to study, and silent-reading drill are so closely related that drill in one, when properly conducted, serves in some measure for drill in the others, makes invalid any excuses for neglect of any of these highly important phases of school work on the ground of lack of time.

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